October 15 Cen

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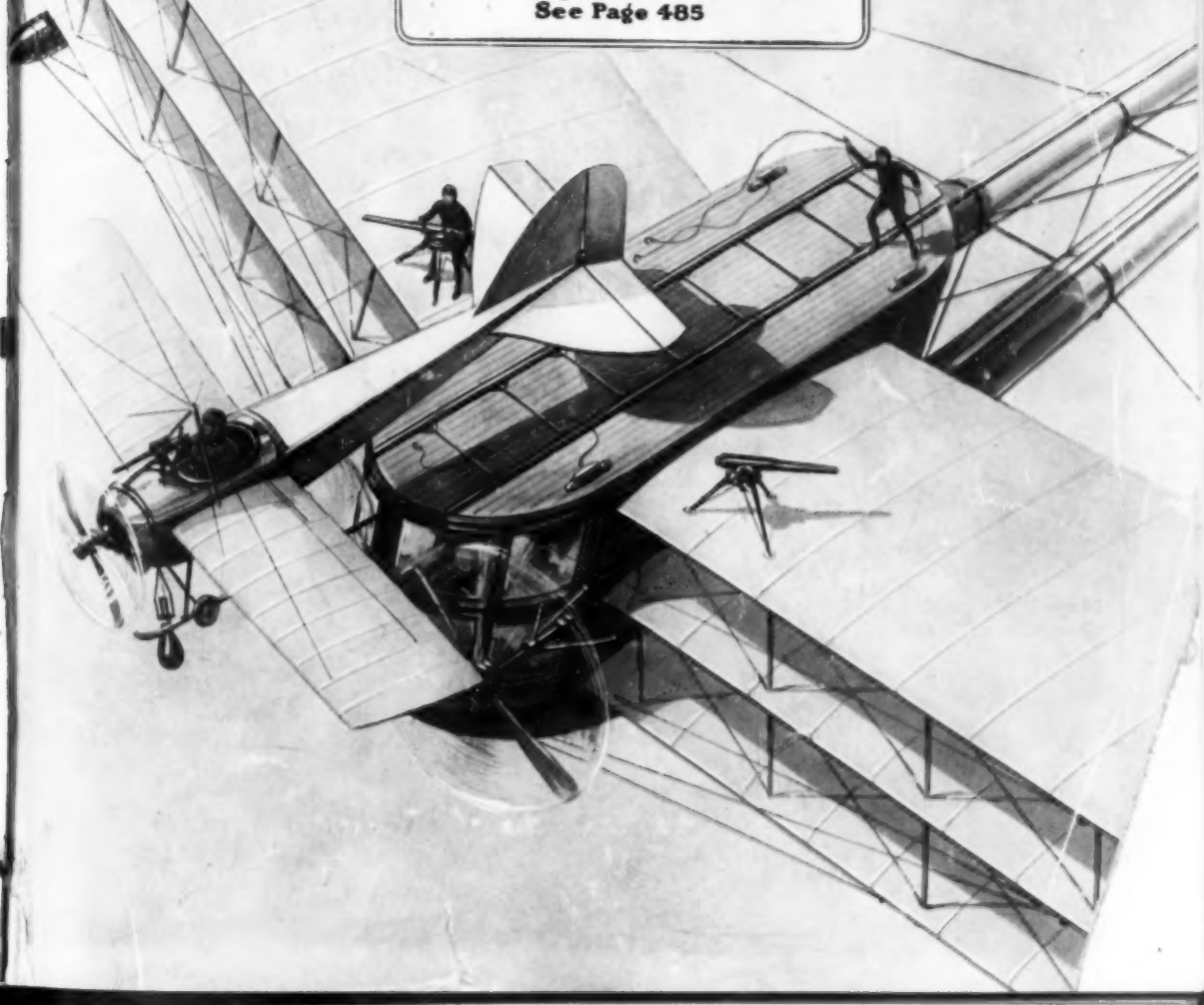
POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

Zeppelins a Failure
Mammoth Aeroplanes to Replace Them?

See Page 485



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Popular Mechanics Magazine

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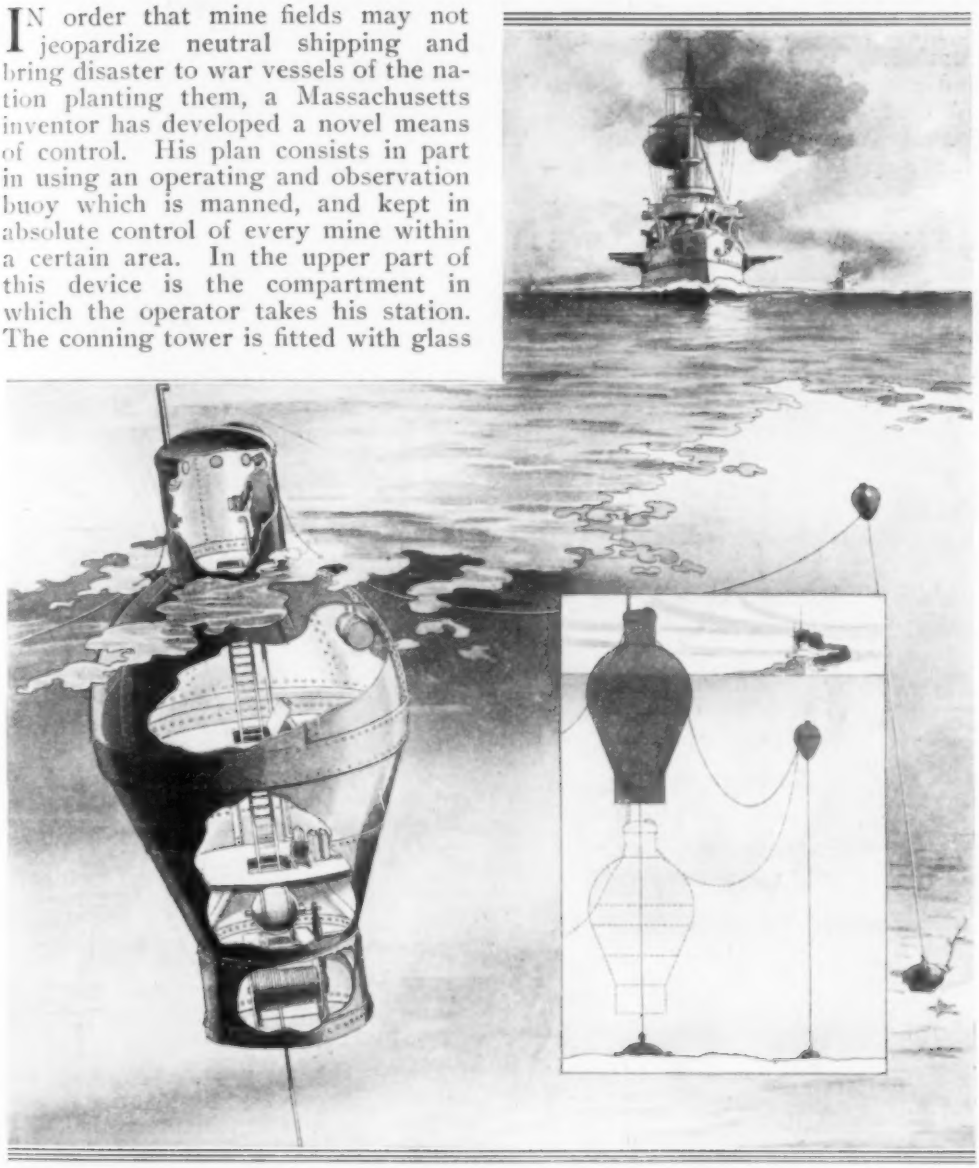
Vol. 26 OCTOBER, 1916 No. 4

Mine Control Protects Neutral Shipping

IN order that mine fields may not jeopardize neutral shipping and bring disaster to war vessels of the nation planting them, a Massachusetts inventor has developed a novel means of control. His plan consists in part in using an operating and observation buoy which is manned, and kept in absolute control of every mine within a certain area. In the upper part of this device is the compartment in which the operator takes his station. The conning tower is fitted with glass



Showing Both the Construction and Plan of Operation of the New Mine-Control System, Proposed as a Means of Obviating the Dangers That Friendly War Vessels and Neutral Merchantmen are Now Subjected to Because of the General Use of Contact Mines

ports and a periscope so that the horizon in all directions can be scanned. A cable extended from the bottom of the buoy is securely anchored to the floor of the sea. In the lower compartment of the buoy are provided batteries, an electric motor, a drum on which the line is wound, and an air-supply system. Heavily insulated wires extend between each of the contact mines and the floating control station.

Upon sighting an enemy vessel the observer submerges until only the periscope remains above the water. As the ship draws nearer the operator lowers the buoy to a depth of 50 or 60 feet, so that it is entirely safe. Should the approaching boat enter the field and strike one of the floating mines, a red lamp on a switchboard before the operator would ignite. By pressing a button the man in control of the station is then able to explode the specific mine indicated to him. Neutral and friendly shipping would, of course, be left unmolested, and in this way all of the danger arising through the use of contact mines would be overcome. A number of experiments have been conducted in the Connecticut River with the apparatus.

FLYING CARTRIDGE CASES CAUGHT IN PISTOL CAGE

For the protection of military and naval airmen, a London inventor has devised a small, light-weight wire cage that may be fitted to the ejector side of an automatic pistol so as to catch and hold empty cartridge cases as they are thrown out. The attachment interferes in no way with the sighting or firing of a weapon but prevents the empty cases from flying against the propeller blades of a pusher-type machine, striking the face of a pilot in case he is seated behind an observer who is firing, or falling where they might jam the control mechanism and cause disaster. When a machine is skimming through the air at the rate of nearly 100 miles an hour, even such a small thing as an empty cartridge case may cause serious results. A pilot might easily be blinded and lose control of his craft were one of his eyes struck. Therefore the invention is considered meritorious and is already being employed by some of the allied airmen. The receptacle is supplied with a small hinged door through which its contents may be emptied from time to time.

The Wire Receptacle Fits over the Ejector Side of an Automatic Pistol and Catches the Empty Shells as They are Thrown Out of the Firing Chamber

VERNE'S UNDER-SEA STORY FILMED FOR SCREEN

Jules Verne's prophetic thriller, "Twenty Thousand Leagues under the Sea," is being enacted on the floor of the Caribbean before the moving-picture camera. For the past year the work has progressed in the vicinity of Jamaica, where, it is claimed, some 200,000 ft. of film have been exposed. Essentially the same methods are being

employed in photographing the production as were used some time ago, and described in this magazine, when the first great under-sea pictures were obtained. The actors appearing in the play are clothed in diving costumes and work at depths of from 30 to 40 ft. below the surface. The suits are fitted with cylinders containing a 30-minute supply of oxygen, so that the wearers move about through the water entirely unencumbered by the air tubes, telephone wires, and cables required by deep-sea divers. The submarine craft used in the photoplay was constructed as nearly as possible in accordance with Verne's description, and while very similar in outward appearance to certain of our early models, it differs in noticeable particulars from them. It is built to submerge to a depth of about 40 feet and is equipped with a torpedo tube, but otherwise is purely a "stage" boat and therefore mounts no engine. Most of the dramatic action takes place beneath the water. It is expected that the undertaking will be completed in time to release the film early this fall.

Making Observations from the Deck of the Submarine

Most of the Action Takes Place on the Floor of the Caribbean: The Leaning Postures of the Actors Here Indicate the Strength of the Tide

This Submarine was Built to Correspond to That Described by Jules Verne. It Is 100 Feet Long and Accommodates 40 Persons

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¶According to a report recently made in the House of Commons, British soldiers at the front are now writing 5,000,000 letters a week to the homeland and are receiving about 7,500,000 letters and 700,000 parcels every week.

PARKING AREAS FOR CARS MARKED ON PAVEMENT

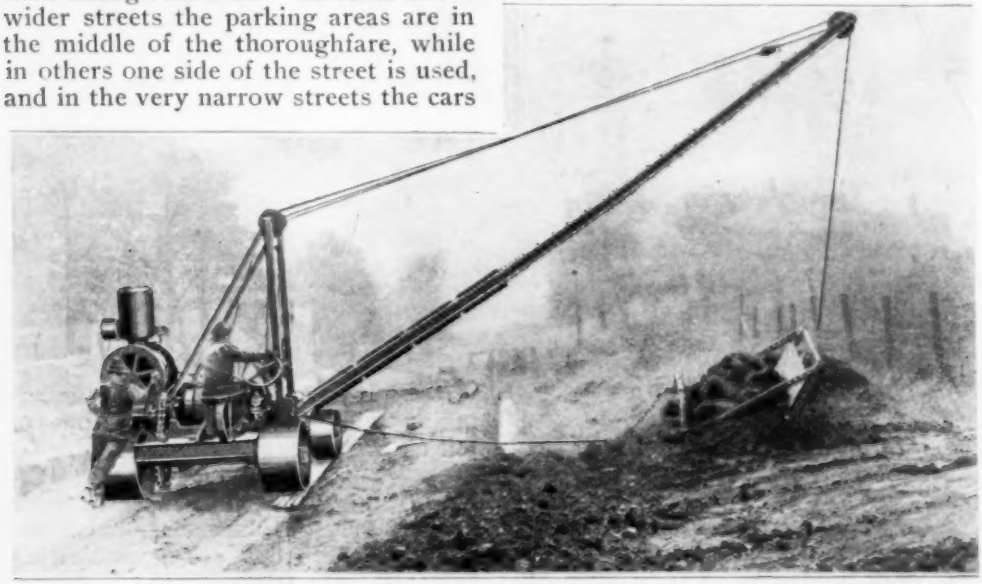
With a view to accommodating the largest possible number of automobiles in its available parking places the city

The City of Sacramento has Made Its Parking Spaces Serve the Maximum Number of Cars by Marking Off Areas, Each of Which Is Just Wide Enough for an Automobile; Many are Set Diagonally

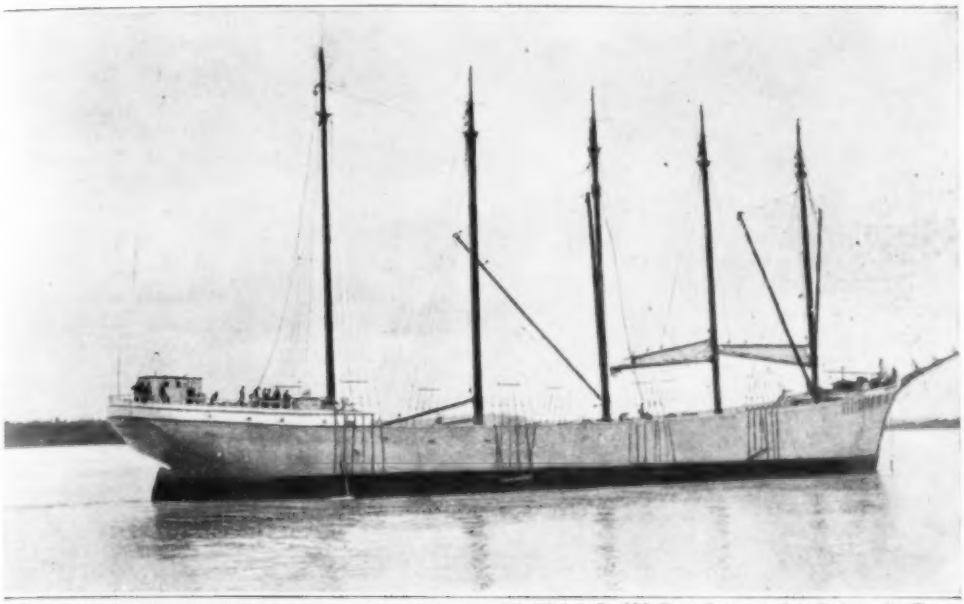
of Sacramento, Calif., as well as other municipalities, has marked off with parallel painted lines narrow portions of the pavement, each of which is just wide enough for a car. In some of the wider streets the parking areas are in the middle of the thoroughfare, while in others one side of the street is used, and in the very narrow streets the cars are required to stand diagonally. In each case the painted lines show drivers how and where to place their automobiles, and they overcome the natural tendency to place cars farther apart than is necessary. The additional accommodations made available by this arrangement have been worth, many times over, the cost of the paint.

TRENCH-FILLING MACHINE DOES MANY MEN'S WORK

A trench-filling machine which is now being employed by contractors enables one or two men to do work which only a large gang of men could perform in equal time shoveling by hand. It consists of a gasoline engine mounted on a low truck having broad-tired wheels and operating a long derrick and a scraper. By means of cables the scraper is carried to the far side of a pile of dirt and then drawn through it. In this way the dirt is drawn into the ditch rapidly. Where fast work is desired, one man devotes his time to moving the filling machine forward, utilizing the gasoline engine to propel the truck by means of a chain drive, while a second man operates the scraper.



A Self-Propelling Trench-Filling Machine Which Operates by Gasoline Power and Enables Two Men to Do What Formerly Required a Large Gang of Shovelers. Such Machines Are Almost as Great Labor Savers as Ditch Diggers Are



The Recently Completed Motor Ship "City of Portland," Which Is 290 Feet Long and is Driven by Two 320-Horsepower Engines: The After Mast Serves as an Exhaust

BIG MOTOR VESSEL ENTERS OCEAN SERVICE

The motor ship, "City of Portland," which is 290 ft. long over all, has a 44-ft. beam, and cost $200,000, has recently been completed for ocean freight service. The vessel is declared to be one of the largest motorboats that has been built in the United States.

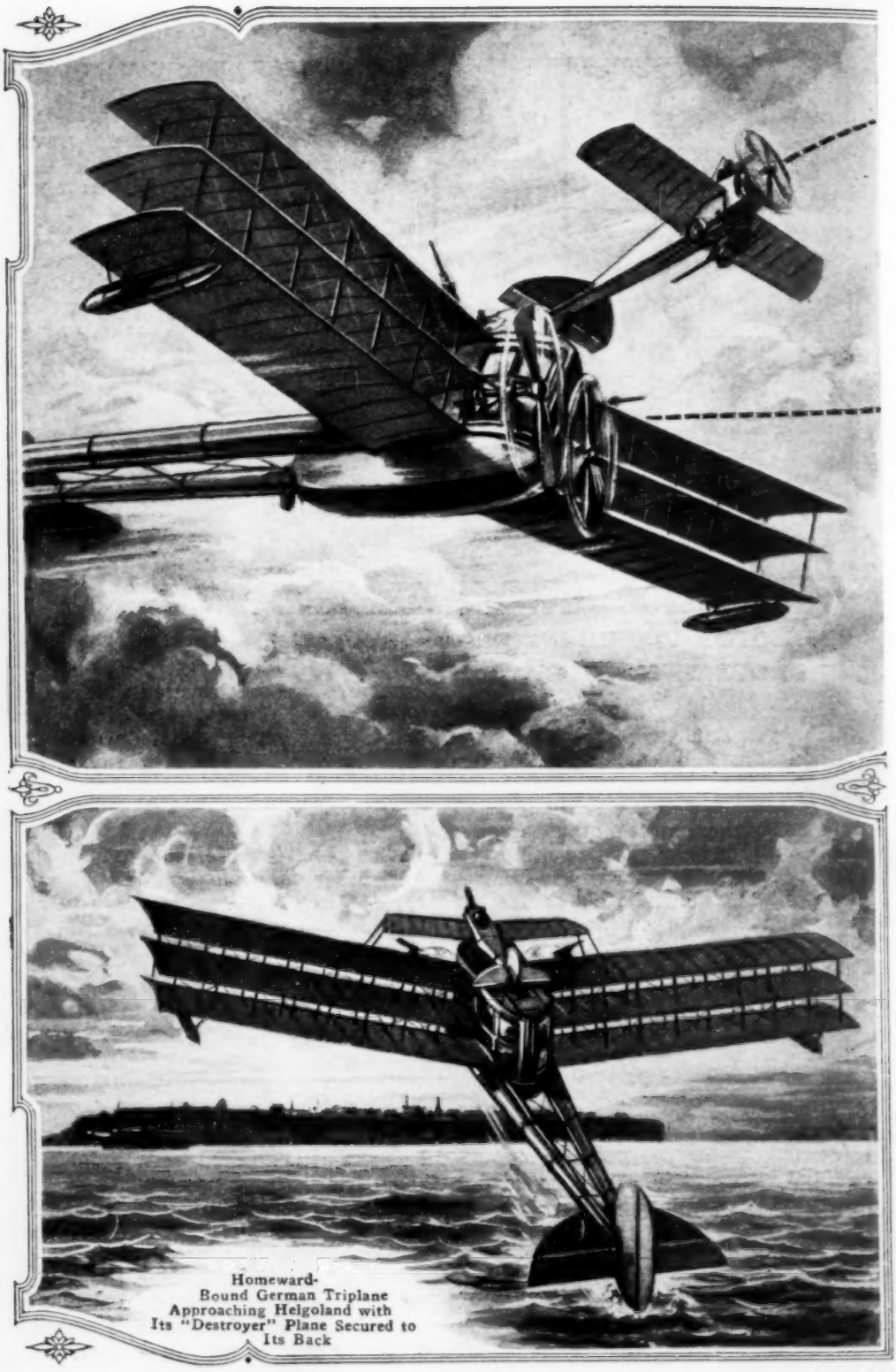
It is equipped with two 320-hp. engines of a modified Diesel type. It is also provided with sails. An unusual feature is the hollow steel after mast which is used as an exhaust. The vessel recently left the Columbia River for Australia carrying 2,250,000 ft. of lumber. It was estimated that the engines would consume 1,200 bbl. of oil during the voyage. The owners believe that this ship will prove superior to other vessels because of lower cost of operation.

¶A St. Louis lumber company having a number of mills and branches in the Southwest is considering installing wireless apparatus with which the various departments can communicate with each other.

"DESTROYER" PLANE CARRIED BY AERIAL "BATTLESHIP"

FROM what is considered a wholly dependable source, information comes concerning a most unusual aeronautical experiment being carried out by German aerial experts. It deals with the development of a powerful flying boat which carries, for both defensive and offensive purposes, a swift, mosquitolike aeroplane on its back. The idea is almost analogous to the dreadnaught and destroyer of naval use. The machine, when last heard of, was being put through test flights, but had not at that time been sufficiently refined to warrant its actual use.

The new machine has such remarkable stability, carrying capacity, and cruising radius that its engineers think it can be made to replace the bulky, highly expensive Zeppelins, which have proved disappointing. If this actually comes to pass it will mark the recog-



Homeward-
Bound German Triplane
Approaching Helgoland with
Its "Destroyer" Plane Secured to
Its Back

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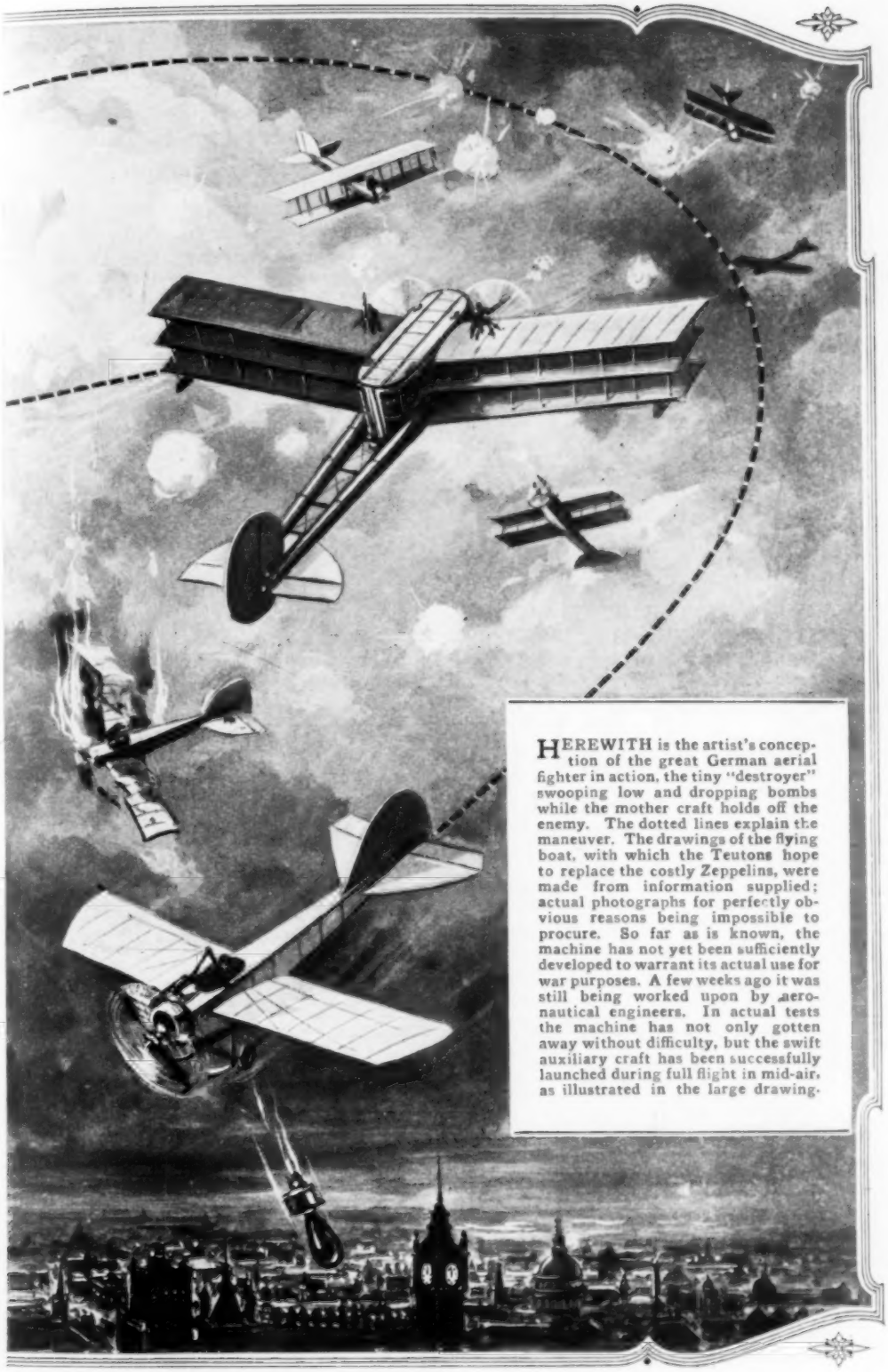


HEREWITH is the artist's conception of the great German aerial fighter in action, the tiny "destroyer" swooping low and dropping bombs while the mother craft holds off the enemy. The dotted lines explain the maneuver. The drawings of the flying boat, with which the Teutons hope to replace the costly Zeppelins, were made from information supplied; actual photographs for perfectly obvious reasons being impossible to procure. So far as is known, the machine has not yet been sufficiently developed to warrant its actual use for war purposes. A few weeks ago it was still being worked upon by aeronautical engineers. In actual tests the machine has not only gotten away without difficulty, but the swift auxiliary craft has been successfully launched during full flight in mid-air, as illustrated in the large drawing.

nized triumph of the heavier-than-air machine over the much lauded but less useful dirigible, for war purposes at least.

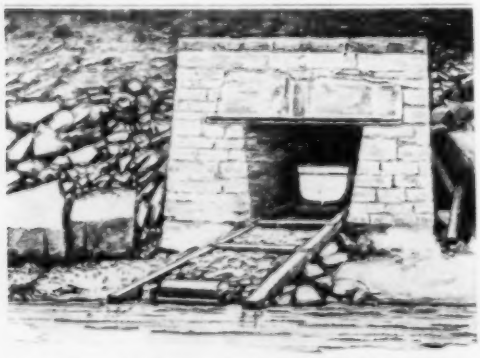
It is a heavily built triplane mounting three motors. The wings, which are stanchly built and of a design that gives the craft great inherent stability, have a total spread of approximately 146 ft. The body is entirely inclosed and its windows fitted with reinforced glass that will not fall apart when subjected to heavy impacts. The panes are made by gluing two thin pieces of glass to the opposite surfaces of a heavy sheet of transparent celluloid. When struck with a hammer, for instance, the shattered part of the glass remains fast to its backing.

Although it is to be supposed that a craft of this size would be difficult to maneuver, as compared with the lighter and more agile machines, it is said to have unusual qualities of stability, because of its design, and to be capable of battling successfully against heavy, fickle air currents that would swamp most flying boats. It mounts two quick-fire guns of small caliber, carries a crew of five men, a cargo of a half ton of bombs, and a sufficient supply of fuel and oil to keep it in the air for 48 hours.

The auxiliary aeroplane which it supports on its back is equipped with bomb-dropping devices and a machine gun. It is provided in order to ward off the attacks of enemy craft and to drop low and hurl high-explosive projectiles upon particular objects of attack, such as arsenals, forts, docks, and naval vessels. The chief difficulty standing in the way of its perfection has been the problem of providing some practical means of enabling the small craft to return to the mother machine after executing its mission. No trouble has been encountered in carrying the tiny machine, nor in launching it in mid-air, but it has been found quite another thing to pick it up again. And this is necessary to render the unit efficient for the part it is intended to play.

RAILWAY CULVERT USED AS A BOATHOUSE

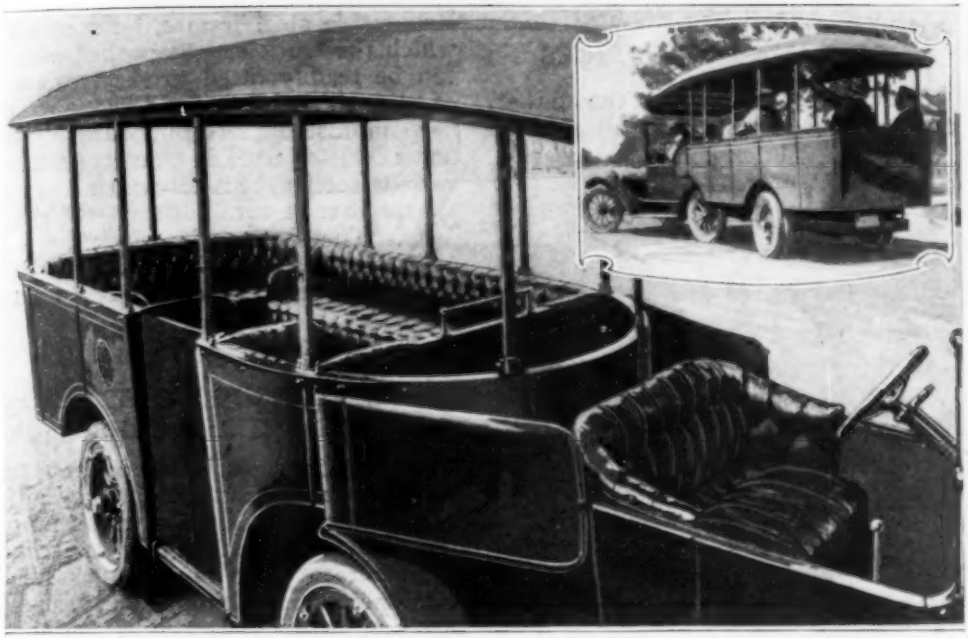
A large culvert through which water passes under a railroad track that skirts the shore of Lake Superior is used by the owner of a fair-sized motorboat as a boathouse. The level of the culvert's floor is a few inches above the lake and rollers have been laid at intervals from the edge of the water back into the passageway along which the boat is drawn. This unusual shelter furnishes ample protection in the severest storms. Ordinarily the amount of water which flows through the culvert is of very little inconvenience. The roof is composed of old iron rails to which the boat is chained when it is brought in from the lake, so that it will not be swept away in case the flow is greatly increased by a storm.



A Railway Culvert on the Shore of Lake Superior That is Used as a Shelter for a Motorboat

MOTOR BUS OF NEW DESIGN FEEDER FOR CAR LINE

At Fresno, Calif., a new type of motor bus is used as a feeder for a surface traction line. The equipment consists of a light automobile acting as a tractor for a passenger-carrying trailer compartment that has capacity for 15 or 18 persons. The two sections are so neatly coupled that good lines are obtained and the appearance of a connected six-wheel vehicle given. A



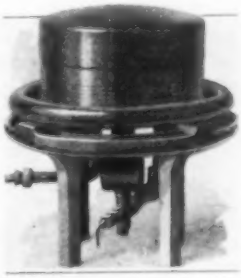
This Car Represents a Small Expenditure and Does the Work of a Street-Car Line. It Turns in a Narrow Street and Backs with Ease

single top covers the entire machine, which is operated in the same manner as any ordinary motor car. A patented steering arrangement is employed which allows the rear wheels to track in the path of those in front, so that the machine turns corners as readily as any vehicle and is able to weave in and out through traffic with ease. Passengers are taken on at the curb line.

The car was built at Los Angeles and driven a distance of 250 miles over mountain and desert roads to Fresno in 10½ hours, averaging 18 miles on a gallon of fuel. Since the motor pulls, instead of carries, its load, just as a locomotive draws a train of cars, it is able to transport many passengers at a good speed without overtaxing itself. It is being used as an extension of the Arlington Heights surface line and carries and transfers passengers to the electric cars. Its economical operation and the fact that it maintains service over a route without requiring the expenditure of some $40,000 for track laying, has caused it to be watched with much interest by street-car heads on the Pacific coast.

OUTFIT WHICH GENERATES GAS FROM KEROSENE

An apparatus which converts kerosene oil into gas and can be installed in any stove, furnace, or lamp, is now being introduced into rural regions, and other places where ordinary fuel and illuminating gas is not available. The kerosene is stored in a central tank to which a pressure gauge is attached and into which from time to time air is pumped under compression. This pressure forces the oil through hollow copper wires to the various burners in the stove or lamps. A steady flame which can be instantly adjusted by means of a needle valve can be generated very readily. It is claimed for this apparatus that the burners operate noiselessly and give off no odor or smoke.



CONVENIENT STEEL TRUCKS FOR BANKS OR OFFICES

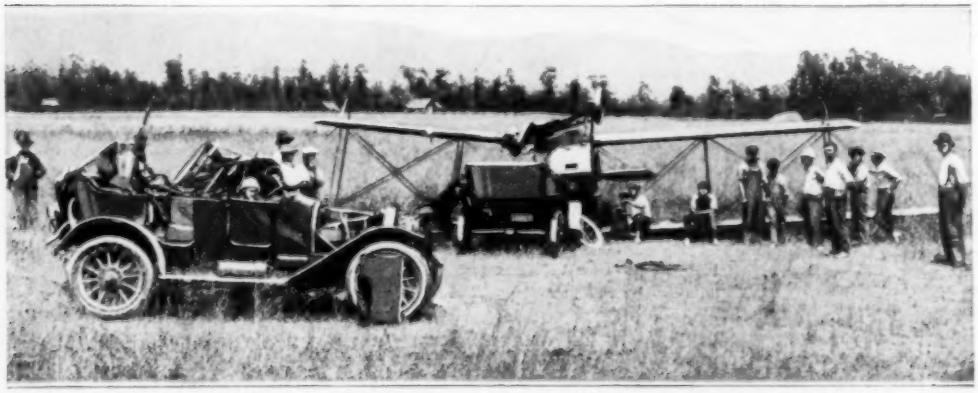
A low steel truck now on the market, and one which is especially adapted for

A Low Steel Truck for Banks or Offices, Designed to Carry Filing Stacks of Various Kinds, or Other Loads

use in banks, stores, and the like for transporting records, etc., consists of a platform mounted on two low wheels and two swivel casters of still smaller diameter. The larger wheels have rubber tires and the smaller ones fiber. Removable steel frames, by means of which the truck can be pushed about, can be readily fitted to the two ends of the platform; they serve also to keep an unstable load in position. The truck is often used in connection with various sectional stacks which fit onto a base that in turn rests on the platform. The sections interlock and remain firmly in position, with the aid of the end frames, while being transported.

FLIER TRYING TO ASCEND HITS THREE CARS

A peculiar aeroplane accident occurred recently near Alta Loma, Calif., when a member of the aviation corps at San Diego, on attempting an ascent, crashed into three automobiles filled with spectators, killing a four-year-old boy and injuring the child's mother. Soon after leaving the ground the flier found that a number of telephone wires barred his way and he was forced to turn his big machine around. As he did so a gust of wind struck it and brought it almost to the earth. Before its course could be changed it had crashed into the three automobiles. The whirling propeller tore and crushed the car tops and instantly killed the boy. When the plane hit the third machine it turned over, as shown in the illustration. The airman was thrown out but not seriously hurt.



Overturned War Plane near Alta Loma, California, and Spectators' Cars Which It Wrecked While Attempting an Ascent. The Ascent Ended Disastrously Partly Because of Obstructing Telephone Wires

STANDARDIZED MERCHANT LINERS ENGLAND'S COMMERCIAL PROJECT

By LEWIS R. FREEMAN

ENGLAND has drawn upon the United States for many things since the outbreak of the war, and the import of American munitions, machinery, and raw materials has reached figures that quite dwarf those of the most active periods of peace time. Yet, great as are the figures for these physical articles of import, it seems likely to be found, when a restored peace gives men the time and the perspective to weigh the ponderable with the imponderable, that the import of American "ideas"—something that has neither cost the importers anything nor yet made any demands upon their overworked ships—will be adjudged to have been a more potent factor in British industrial mobilization than American machinery and raw materials. The war and war's demands have made the once conservative Briton an open-minded enthusiast in the matter of anything calculated to save time and labor, and as this chances to be the very line along which the United States—always short of labor and increasingly impatient of the unnecessary loss of time—has the most valid claim for distinctive progressiveness, it is only natural that England should have turned to us in her time of need.

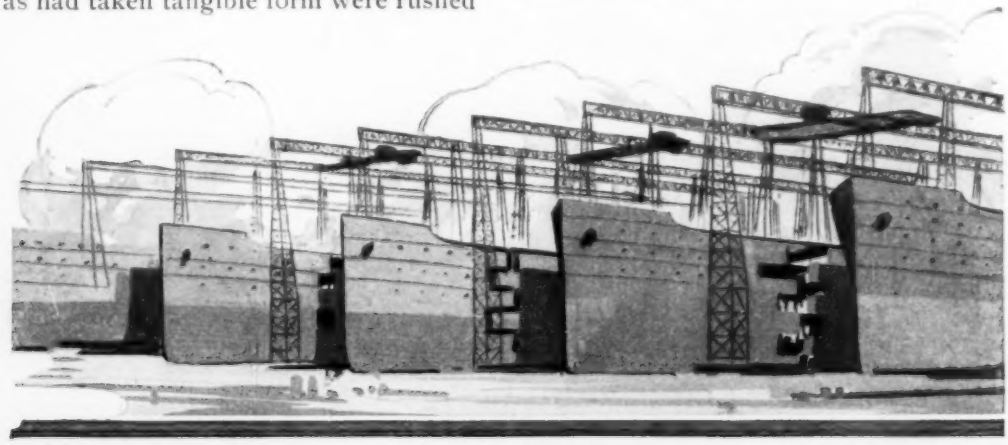
Up to the outbreak of the war England's problem was not to find men for the work, but rather to find work for the men. That country's percentage of permanent unemployment was higher than that of any other of the world's great industrial nations, and when one called an Englishman's attention to the waste of effort involved in one man's holding a ladder while another climbed, or of one man pulling a lawn mower while another pushed, it was only natural that the reply was to the effect that it would be foolish to throw any more men out of work with labor-saving contrivances when from 10 to 20 per cent of the workers of the country could not find jobs as it was. It was idle to point out that a perfected industrial and commercial organization would absorb all of the capable surplus labor and ultimately create a demand for more; the dead weight of her mass of (apparently) permanently unemployed was too great to allow industrial England to get up the energy for the initiative.

The war changed all this almost in a day. Within a few months the number of men actually enlisted was far greater than the highest total ever unemployed, while, concurrently, the doubling, and tripling, and quadrupling of industrial demands made England's need of men more imperative, more insistent, than America—even a western bonanza mining camp—had ever known. No longer was it the man that had to seek the work; it was the work that was seeking, importuning, the man. The war sword had cut out in a few strokes the cancer of unem-

ployment that had been spreading and eating into England's vitals for three-quarters of a century. Almost between sunset and sunrise England came into the market for labor and time-saving contrivances—was opening up her mind toward labor and time-saving ideas.

English engineers and manufacturers of machinery have always regarded the remarkable lengths to which standardization was carried in the United States with feelings about equally compact of admiration and envy; admiration of the manner in which American manufacturers were able to pay double the English wage scale and yet undersell them in foreign markets, envy that they themselves seemed indefinitely precluded—by conservatism and lack of initiative—from employing similar methods. Such experiments as had been adopted in this line had proved entirely successful. Standardization of parts according to American practices had put the British bicycle industry on its feet after its supremacy, even in domestic markets, had been threatened by the advent of the more economically built machines from the United States, and at the outbreak of the war a very comprehensive movement was under way to counter the "menace of the cheap American motor car" (to use the favorite British trade-journal expression) by similar measures. Such plans for the standardization of motor parts as had taken tangible form were rushed into effect as rapidly as possible, and it is enough to say that they have played an incalculably important part in the instant response British automobile factories were able to make to war demands. American motor manufacturers will find British competition in the low-priced-car line far stronger and better organized after the war than it was before. In all of the new munition factories standardization has, from the outset, been followed to the least detail. It is these beginnings in a practice already many years old in America, as well as the new open-mindedness and progressiveness that have characterized British industrialists since the beginning of the war, that have paved the way for the greatest experiment the world has ever seen in scientific standardization.

The remarkable British project for building standardized ocean-going steamships was decided upon, undoubtedly, after construction of this character had actually been inaugurated in the United States in the course of the present building boom in ocean tonnage. The significant thing about the British move is that, though they are following an American plan and an American lead, they are in a position, and are undoubtedly resolved, to carry out their plan on an incomparably greater scale than it would be possible to undertake it in America for a good many years to come.

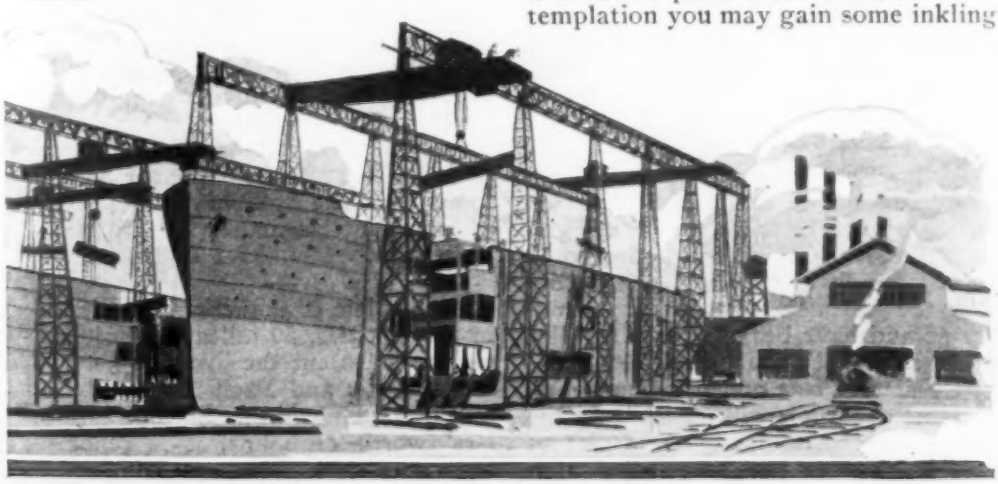


"Almost immediately we shall begin work on slips for 10 ships of between 8,000 and 9,000 tons' displacement and and the aggregate number of them will

In defining standardized shipbuilding one need go no further than to say that it is carrying to freight-steamer construction the same principle of interchangeable parts as has been so successfully followed by American manufacturers in the turning out of practically all industrial machinery, and notably automobiles. As there is no more reason for maintaining distinction and "individuality" in a freight steamer than there is in a freight car or motor truck, there is no valid reason why they should not be turned out the same way, that is to say, a hundred or even a thousand, quite identical in size and design, and with the corresponding part of one—whether in engine or hull—capable of replacing, or being replaced by, the corresponding part of another. In short, the plan contemplates the building of a steamer just as much to a model as is done with a motor car. This will have the effect not only of cutting down the initial cost from 15 to 25 per cent, but also of saving several hundred per cent in the cost of repairs and replacements, and, what is even of greater importance, often days and weeks of time. The following is a brief outline of the scheme England is hurrying to put into execution, as told me recently by one of the directors of the newly formed company which has the great work in hand.

"Like many other things which have operated powerfully to strengthen our industrial organization," said this gentleman when I called upon him in his London office, "the idea we are about to give effect to originated in America. In every other instance I can recall, however, what we have done over here has been hardly more than a pale imitation of the original. In this case certain factors—principally because, after as before the war, the growth of the American merchant marine will be strongly militated against by the fact that it will still cost you 25 per cent more to build a ship and 50 per cent more to operate it than it does us—seem to give us ground to hope that at last we shall be able to carry out an American scheme on an even grander scale than will be possible for the Americans themselves.

"Perhaps I can give you no better idea of the magnitude of the problem involved in ship standardization than by saying that the capital necessary to build and operate a plant capable of turning out a hundred thousand automobiles in a year would hardly build and operate a plant capable of launching more than a dozen 8,000-ton ships in the same period. To reap any practical advantage from the system, a production many times greater than this is necessary, and when I tell you that it is such a plant that we have in contemplation you may gain some inkling



of exactly the same model. These same slips will, however, be capable of taking types up to 12,000 tons or more, be increased just as rapidly as possible."

of the scale on which we intend to work.

"Realizing at the outset that the operations would have to be on a plan beyond anything which even the largest of our great shipping companies would be able to finance, the idea was conceived of making the initiatory venture through a company backed by a number of the strongest of such concerns. Among the stockholders in this company are the Peninsular and Oriental, British India, New Zealand Shipping Co., Oriental Steam Navigation Co., Federal Steam Navigation Co., Shire Line, and a number of other of the strongest British merchant lines. Between them they own several thousand ocean-going ships, valued at some hundreds of millions of pounds, and the aggregate of their demands for freight carriers in the first half decade after the war will be many times greater than our new plant can begin to turn out. The old yards will have to be drawn on heavily in any case, but even in these latter it is the intention to introduce standardization just as fast, and just as far, as there is opportunity for it. There will be no issue of stock to the public, the plan being to make the new concern a coöperative one participated in only by shippers.

"We have an ideal site for our first yards on the River Wye, near the Bristol Channel, with a launching depth of 45 ft. Coal and iron are cheaper here than in any other part of Great Britain. Almost immediately we shall begin work on slips for 10 ships of between 8,000 and 9,000 tons' displacement and of exactly the same model. These same slips will, however, be capable of taking 'types' up to 12,000 tons or more, and the aggregate number of them will be increased just as rapidly as possible. Before very long the keels of a score or more steamers should have been laid down. The more ships that can be built of absolutely similar size and design the better, but provision will be made to the end that transition from one size of ship to another can be effected with the change of a minimum number of standardization units. That is to say, it will be so arranged that there will be many interchangeable parts between ships of even as great disparity as 9,000 and 15,000 tons.

"Perhaps an even greater economy than in that of original construction by this plan will be effected when the occasions for repairs and replacements arise. A 20-year-old freighter that has seen average service will probably have been rebuilt two or three times over in the course of that time, many of the replacements being made in out-of-the-way places at great expense in time and money. With a hundred standardized ships plying on the main trade routes, we calculate that it will be practicable to keep almost complete sets of spare parts at all of the principal foreign ports, while smaller stocks of such parts as could be replaced by the ships' engineers can be kept at even comparatively remote coaling stations. Probably, too, the ship itself will find it practicable to carry and, in case of emergency, replace many of the smaller and simpler parts that at present have to be ordered specially, almost invariably with great incident delay. Doubtless, also, we shall contrive plans by which some replacements which now require dry-docking and special facilities will be just as well performed in harbor, or even at sea. The ultimate possibilities of the plan are almost limitless, and we have high hopes of the help it is going to be to us in solving the after-the-war ship shortage, something that is going to prove a troublesome problem in any event. We have many things to thank America for in our present time of stress, and for nothing more than the valuable lead she has given us in this matter of ship standardization."

¶The project of tunneling James Peak in the Rockies, 50 miles west of Denver, so as to cut the distance between the Atlantic and Pacific coasts by 73 miles, is taking form. Six million dollars' worth of bonds, it is reported, have been sold. The bore will be 6.04 miles in length.

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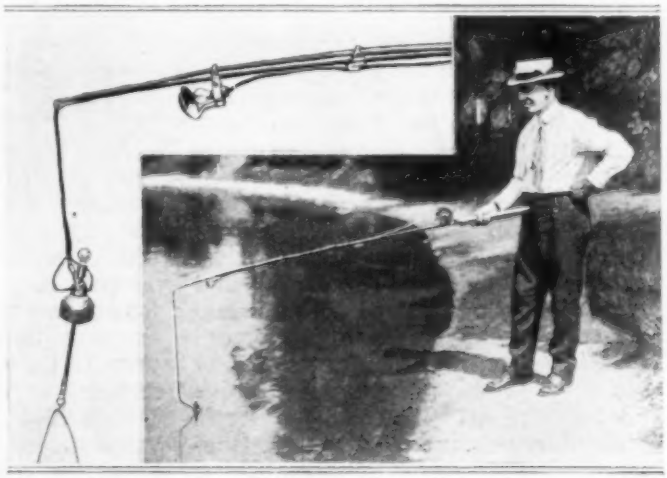
TEACHING WOMEN CARE OF CHILDREN'S TEETH

THERE have been established in New York City two children's clinics for preventive dentistry and a training school for women dental hygienists. In these clinics, one of which is shown in the above illustration, women receive instruction in the scientific care of children's teeth, the patients being boys and girls having affected teeth. The majority of these women will be employed by the New York School Board to instruct the school children of the city. All ages from kindergarten to high school will be included. Other dental hygienists will assist dentists and hospital physicians.

ELECTRICALLY LIGHTED FISHING ROD

An electrically lighted fishing rod is the invention of a Columbus, Ohio, sportsman who uses his device for night fishing. The grip of the rod is hollow and contains two electric batteries which are connected with contact points on the reel. An electrical duplex cord runs to two small bulbs, one of which is set near the outer end of the rod while the other is mounted on the float or bobber. The light on the rod is shielded by a reflector; the electric wire serves also as the fishline. The insulation is so complete that the bobber can be drawn under the water by a fish without putting out the light. All the parts of this fishing device are detachable so that it can be taken apart or assembled in about three minutes.



A Fishing Rod with an Electric Bulb Attached to It and a Bobber on Which Another Bulb is Mounted: Current is Supplied from Batteries in the Handle

PUNCH BOWLS OF MOLDED ICE FOR RECEPTIONS

Punch bowls made of ice with the aid of molds are novelties which are being sold by an ice company in Marietta, Ga., for use at parties, receptions, etc. These bowls are made with very thick walls and can be fashioned into as many shapes as there are molds available. The freezing of the water into the desired form is regarded as much more satisfactory than cutting a bowl out of a block of ice. These vessels for holding punch have a capacity of one gallon; in warm weather they are able to retain cold liquid from four to five hours. Flowers are placed in the water to be frozen in such a way that they produce a very decorative effect in the ice. The clearest ice is obtained by using distilled water. Goblets of ice, a somewhat similar novelty, have already been described in Popular Mechanics Magazine.

A Punch Bowl Made of Molded Ice in Which Flowers have been Frozen for Purposes of Decoration

USES OF CAVALRY IN THE PRESENT WAR

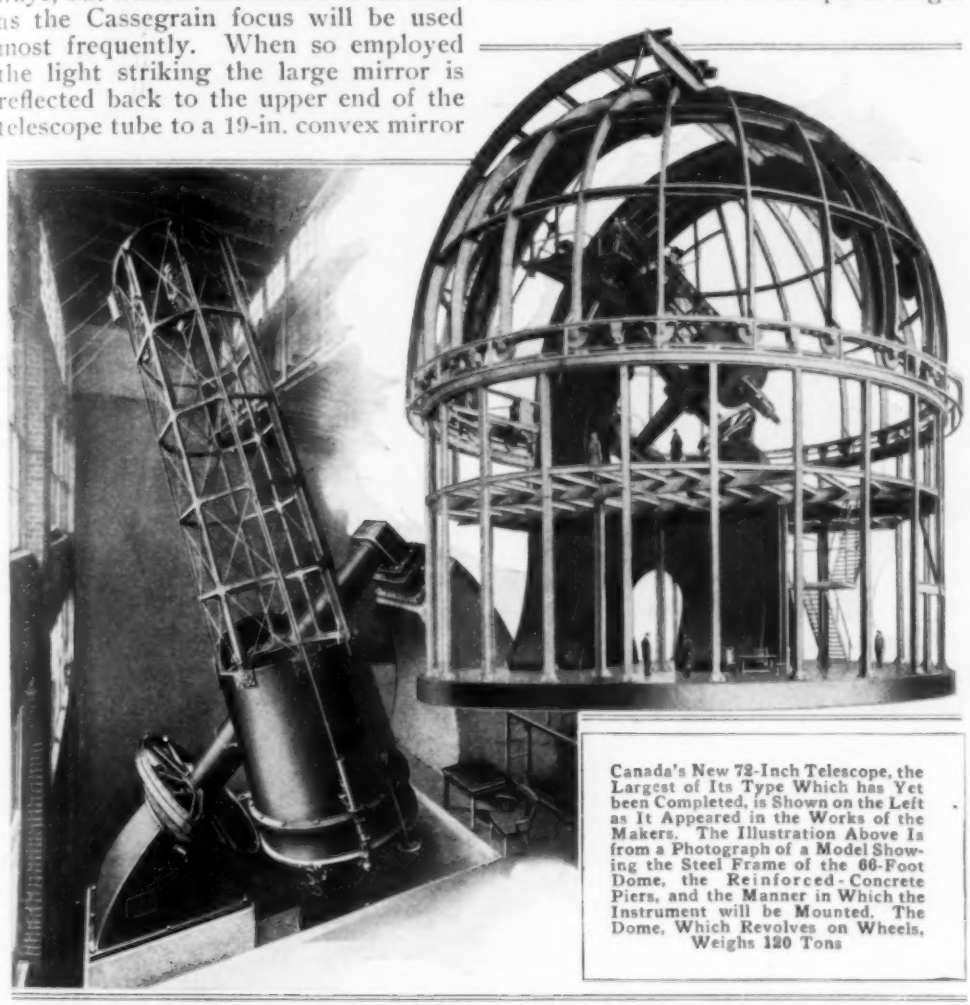
After having observed the various uses to which the French cavalry has been put during the present war a French army officer who has been visiting this country has declared that, with certain modifications as to armament and tactics, mounted troops will be used as much as ever in future wars. In trench warfare the cavalry regiments are divided into halves and while one part serves in the trenches the other recuperates at the rear. When the trench troops are to be relieved the reserves ride up close to the line and change places with their comrades, and the latter ride back to the rear on the same mounts. On the eastern front there is plenty of room and the cavalry is used extensively by both sides. When the cavalry first occupied the French trenches the Germans soon discovered the fact because of the different explosive effect of a cartridge in a carbine and in a musket and they were quick to charge the trenches with bayonets. This soon caused the cavalry to attach bayonets to their carbines. In the opinion of this French officer, the use of cavalry in the United States would be perfectly normal, in case of war, considering the nature of the country over which it would probably operate.

CANADIAN TELESCOPE SETS NEW RECORD AS TO SIZE

A 72-in. reflecting telescope, which ranks in size as the largest telescope of that type yet completed, has been constructed for the Dominion Astronomical Observatory at Victoria, Canada. The mirror, which in this type of an instrument takes the place of a lens in concentrating the rays of light, measures 73 in. in diameter over all, is 12 in. thick at the edges, and is pierced by a hole 10⅛ in. in diameter. The silvered upper surface is a parabola to bring the reflected light to a focus 30 ft. above the mirror. This enormous piece of glass weighs 2¼ tons and yet

is so accurately supported that no flexure can distort the surface, which must nowhere deviate from the theoretical curve more than a two-hundred-thousandth of an inch. The telescope is designed to be used in three different ways, but what is known to astronomers as the Cassegrain focus will be used most frequently. When so employed the light striking the large mirror is reflected back to the upper end of the telescope tube to a 19-in. convex mirror and thence back through the central hole in the large mirror to an eyepiece.

The instrument weighs 55 tons and will rest on massive piers of reinforced concrete. The tube is 31 ft. long and weighs 12 tons. Of unusual interest from an engineering point of view are the dome and observing bridge. The former is 66 ft. in diameter and is provided with a double shutter having an opening 15 ft. wide. It weighs 120 tons. All the movements, including revolution to any desired position as well as the operation of the shutter, windshield, and the observing bridge, are accomplished by means of electric motors. One other telescope of larger size has been projected but is not yet completed, so that to date the Canadian instrument is the largest of this type, and in fact has the largest aperture of any telescope in the world.



Canada's New 72-Inch Telescope, the Largest of Its Type Which has Yet been Completed, is Shown on the Left as It Appeared in the Works of the Makers. The Illustration Above Is from a Photograph of a Model Showing the Steel Frame of the 66-Foot Dome, the Reinforced-Concrete Piers, and the Manner in Which the Instrument will be Mounted. The Dome, Which Revolves on Wheels, Weighs 120 Tons

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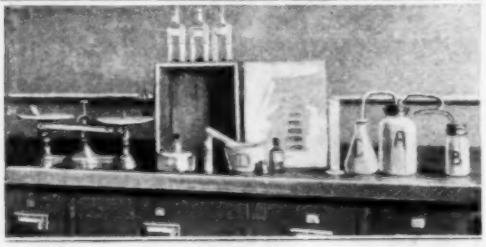
¶Recent observations made in northern Norway showed that the majority of aurora-borealis displays take place at a height of from 60 to 65 miles.

PORTABLE SOIL-TESTING APPARATUS

A portable soil-testing outfit, with which one can quickly determine the fertilizing value of limestone and

Making a Soil Test in the Field with the Aid of a Portable Outfit



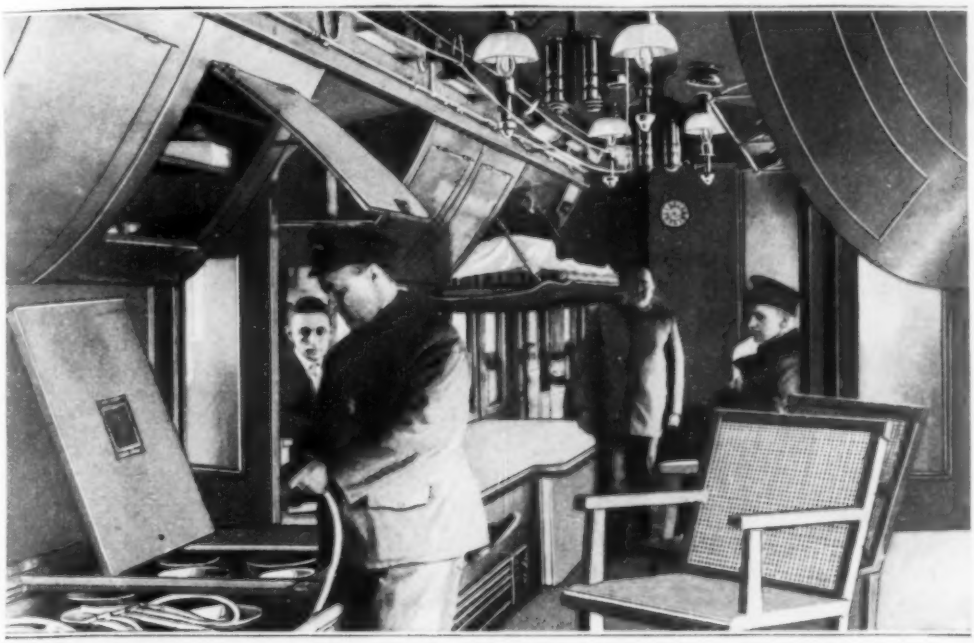
The Entire Outfit is Carried in the Case Shown, Which Is 10 Inches High and Weighs Eight and One-Half Pounds

analyze soil to ascertain the amount of limestone required per acre, has recently been placed on the market. Oyster shells, marl, and air-slaked lime can also be examined for their fertilizing value. The entire apparatus can be packed in a box, measuring 10 by 8 by 6 in., and consists of an alcohol lamp, a balance, a mortar, a measuring cup, a graduated cylinder, some glass tubing, and a few bottles of chemicals. Fastened to the inside of the door of the case is a chart to aid one in making rapid computations of the fertilizing value of the material tested. An analysis of limestone can be made in about 10 minutes. The apparatus is intended especially for the convenience of agricultural advisers, county agents, and other agricultural experts whose duties make it inconvenient for them to depend entirely on a laboratory.

PHOTOS TAKEN IN A SHOP WITHOUT STOPPING WORK

A very advantageous method of taking commercial photographs such as store or shop interiors, pieces of machinery about which men are working, etc., and one which is more satisfactory than making short-time exposures or flashlights, is to set the camera with a very small stop and expose the film for a long time. This method causes the least disturbance in shop routine, if the picture is being taken in a shop. The taking of a five or ten-minute exposure means a considerable money loss in a large establishment and even a flashlight causes a universal interruption of work. The picture reproduced herewith was taken in a shop in which the men were constantly moving back and forth in front of the camera and yet a sharp likeness of the steam-shovel dipper was obtained with scarcely a suggestion of a figure showing in it. A small stop was used and the film was exposed 45 minutes. Another economy was effected in this case by painting the shovel light gray and so securing a picture which needed very little retouching.

A Photograph of a Large Steam-Shovel Dipper Taken in a Busy Shop without Interrupting the Work of the Men, Who Frequently Passed before the Camera



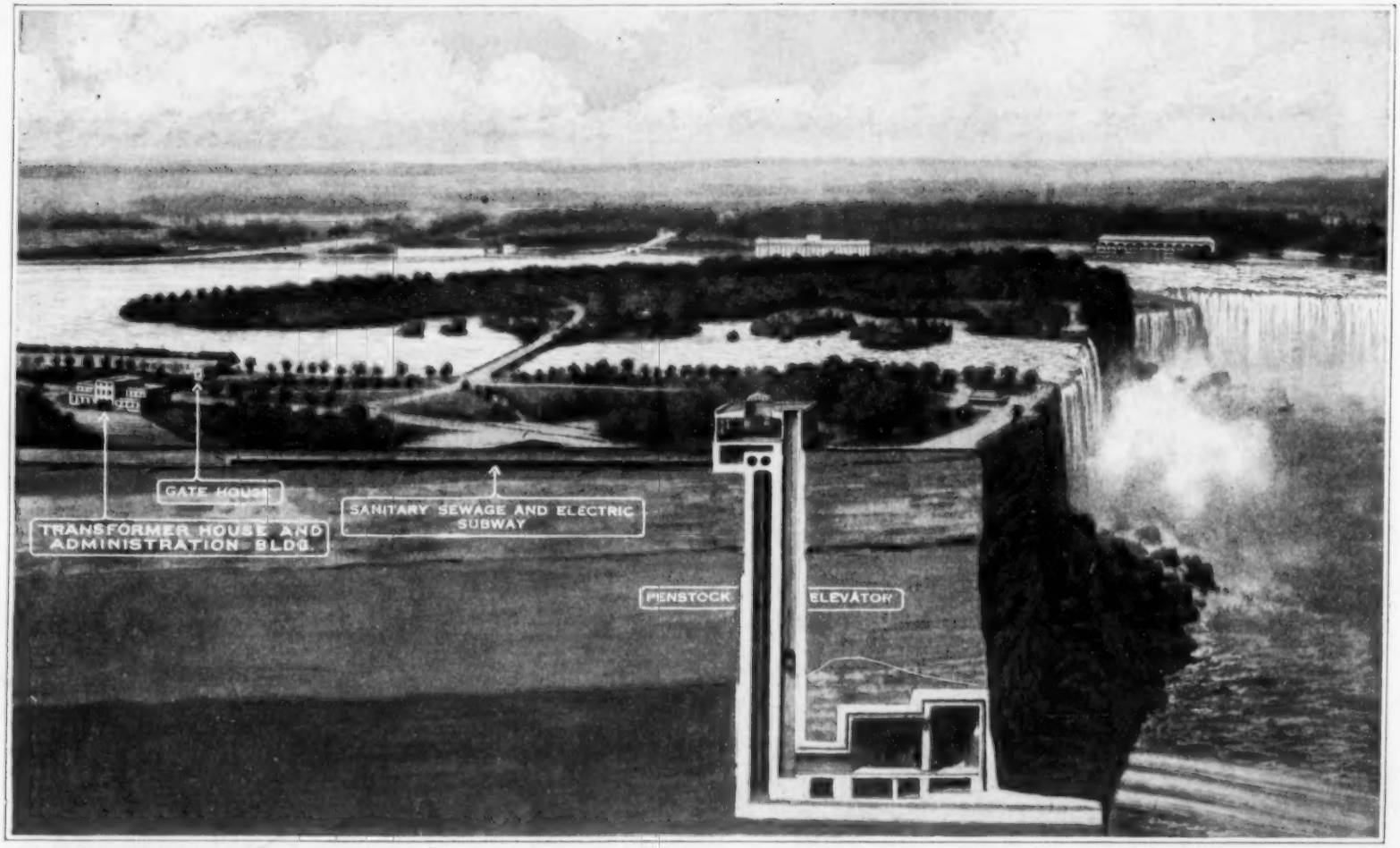
New All-Steel Railway Coach Equipped by the Bureau of Fisheries for Transporting Young Fish to the Streams and Lakes of the Country, and Having Living Accommodations for a Force of Five Men

CARS BUILT FOR CARRYING FISH TO STOCK STREAMS

The Bureau of Fisheries has recently equipped and manned with five men each, six railway cars for transporting young fish which are used to restock the streams and lakes of the country. One of these coaches, which in general equipment is typical of them all, is an all-steel structure and carries one hundred and thirty 10-gal. cans, each having a capacity for two hundred 2-in. fish. During transportation the fish are supplied with fresh water and oxygen by means of air and water pumps operated by a 6-hp. steam boiler which also serves as an independent heating plant to supplement the usual heating equipment that is used when the car is connected with a locomotive. Tanks for carrying a reserve water supply are located underneath the car; a one-ton ice box is also provided. The car is equipped with upper berths for the force which accompanies it, a cook's galley, an office, and space for a dining table. Something of the service which these cars perform is indicated by the fact that the bureau's output for the year ended June 30, 1915, including lobsters and fresh-water mussels, totaled over four billion specimens.

SIMPLE DEVICE LOCKS DESK TELEPHONE

A simple patented device which can be attached to any desk telephone prevents the use of the instrument by any person who is not supplied with a key to unlock the clasp. The invention consists of a metal band which extends around the standard of the transmitter; when the padlock which is a part of the device is in place it prevents the hook that supports the receiver from being raised.



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This Drawing Shows in Some Detail How It is Proposed to Harness the Waters of Niagara without Marring the Scenic Splendor of the Falls. If the Plan were Carried Out through the Coöperation of State and Local Authorities, Electric Current for Lighting and Power Purposes could be Supplied to Towns in Western New York at Low Rates

PUBLIC-OWNED POWER PLANT PROPOSED FOR NIAGARA

In the hope of bringing about the establishment of a state-municipal hydroelectric plant at Niagara Falls that could supply current at low rates to towns in western New York, an association of business men's organizations of Buffalo and near-by communities has been formed to promote a new water-power development scheme. The body is endeavoring to obtain from the government the right to take a flow amounting to 4,400 cu. ft. a second from above the falls. This is possible under the existing treaty with Canada. In addition it is planned that the 600 cu. ft. of sewage-disposal water from the town of Niagara Falls should be utilized, making in all 5,000 cu. ft., or enough to produce 100,000 horsepower.

The main volume of water would be conducted through two 18-ft. underground conduits. These would lead to eight or ten perpendicular penstocks connecting 10,000 or 12,000-hp. turbines located in a partly concealed subterranean power house constructed in an excavation at the bottom of the cliff near the American falls on the New York State reservation. The site would be adjacent to the present landing of the "Maid of the Mist." The underground chamber, near the level of the lower Niagara River, would be about 160 ft. long and 60 ft. wide, with air spaces between double concrete walls to exclude dampness. The front side of the power house would be flush with the cliff wall, and of glass and steel construction. It, as well as its observation galleries overlooking the water, would be partly hidden from view by vines and shrubbery. Access would be gained by elevators operated in shafts adjoining those of the penstocks and communicating with a small, artistic building at the surface.

The entire plant would be located on the New York State reservation and as contemplated would apparently not mar the scenic grandeur of the falls or surroundings. The engineering phases of the scheme are not new, but the public-ownership idea and the location are original. Engineers estimate that power could be developed at a cost of about $6 per horsepower per year.

PATTERNS FOR MAKING NEW BODY FOR POPULAR CAR

The transformation of a well-known low-priced touring car into a light two-passenger car with lines suggesting speed, can be accomplished by any person who has a little familiarity with tools, and who will use as his guide a set of patterns now on the market. The materials required for making the change can be secured at any hardware store. The body for which these patterns provide is rounded, save at the radiator, and has straight lines that converge slightly toward the front, making the car look like a racer. The seat is set low, requiring the occupants to extend their feet almost straight in front of them. The shape of the hood and cowl tends to direct the wind over the heads of the passengers. Just back of the seat is the 18-gal. gasoline tank which is oval in cross section. A saving in fuel and tires results from the fact that the body is very light. Just back of the gasoline tank are carried the spacious tool box and a spare tire. A searchlight is mounted above the cowl.

A Low-Priced Car Fitted with a Homemade Racer Body Built from Special Patterns That Are Now on the Market

SMALL OFFICE STRUCTURE IS BUILT LIKE SILO

In a western town a man who is engaged in the erection of concrete silos has constructed a novel office

Curious but Rather Appropriate Office Constructed by Silo Contractor in Small Town

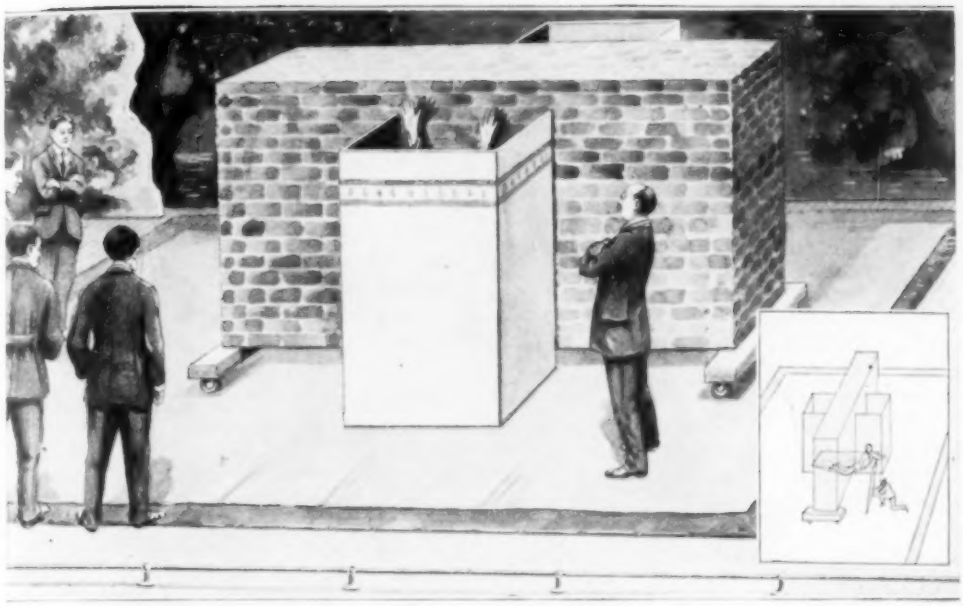
building which in addition to other things serves to advertise his business. Although it is fitted with windows and a door, it is virtually a stumpy silo itself, circular in form and built with interlocking concrete blocks that are bound firmly with encircling rods of steel. When negotiations are being made with a prospective customer the contractor is able to describe his silo and the details of its construction effectively by merely showing his office. Obviously this is far more satisfactory than to place entire reliance in photographs or blueprints. The odd appearance of the structure naturally attracts the attention of agriculturists and others who might be interested in silo construction.

BIG INDUSTRIAL-WELFARE EXHIBIT IN DETROIT

A permanent exhibit, costing approximately $50,000, showing what is being done in various parts of the country to better industrial conditions, is now maintained by the welfare bureau of the Detroit Board of Commerce. Among its features is a display showing the large dining room and splendid equipment maintained for the employes of a large motor company. Another exhibit is a small replica of a cafeteria in which are fed daily 4,000 persons employed in a large plant in Cleveland. A miniature recreation room, similar to those being installed in modern factories, is shown with two small bowling alleys, several billiard tables, etc. A brilliant transparent display sets forth what a large life insurance company is doing for its employes. These are only a few of many interesting features.

PUZZLING VAUDEVILLE FEAT IS SIMPLE TRICK

Like nearly all of the so-called mystery acts one sees on the vaudeville stage and elsewhere, that in which a performer apparently passes through a solid brick wall while momentarily screened from the audience, is a strikingly simple trick. Across a carpeted stage a brick barrier about eight feet high and a few feet longer, built on a platform fitted with casters so that it may be moved freely, is placed. On each side of the wall, which is supported a couple or more inches above the floor, a screen is set. After everything has been inspected in the usual manner by a number of volunteers from the audience, the members of this "committee" are told to stand on various sides and watch carefully. The performer then slips behind the upstage screen and a few seconds later announces his successful trip through the masonry. The removal of the first screen discloses his disappearance, while the turning of the wall shows him actually to be on the other side.



When the Trapdoor beneath the Wall is Opened, the Carpet, Which is Tacked in Place, Sags Sufficiently to Enable the Performer to Worm His Way to the Other Side

There are no holes in the carpet or in the wall, but there is a trapdoor in the stage flooring. When this is opened from below, the carpet sags sufficiently to allow the performer to squeeze beneath the barrier. Since the men from the audience are standing on different parts of it, there is little chance of the rug, which is tacked in place, being drawn far enough out of line, when sagging, to be noticed. Obviously the trapdoor is closed as quickly as the performer has wormed his way through. Schemes similar to this are as old as tradition, but as a rule the acts in which they are employed succeed in puzzling the average audience.

WATER NEEDED TO COOL "AIR-COOLED" GUNS

One of the many things which the United States soldiers have learned on the Mexican border is that a certain type of machine gun which is supposed to be air-cooled scarcely cools at all when subjected to steady service for any length of time. The barrel is provided with radiating flanges like the exterior of an air-cooled gas-engine cylinder. The accompanying illustration shows the cloud of steam which was produced when water was poured on one of these guns after it had fired 250 rounds of service ammunition. Water is now applied to these guns with long-handled sponges which have been provided for the soldiers for this purpose. These weapons each have a spare barrel for use when the other barrel gets hot and yet that provision is inadequate to prevent overheating. If, after protracted firing, a sudden advance or retreat were to be ordered

The Cloud of Steam Shown in Front of These Soldiers at the Border is Caused by Applying Water to a Hot Machine Gun Supposed to be Cooled by Air

it is entirely possible that the hot guns would char or set fire to the packs in which they were placed. About a year ago another type of gun which is water-cooled was ordered adopted in place of the air-cooled weapons.

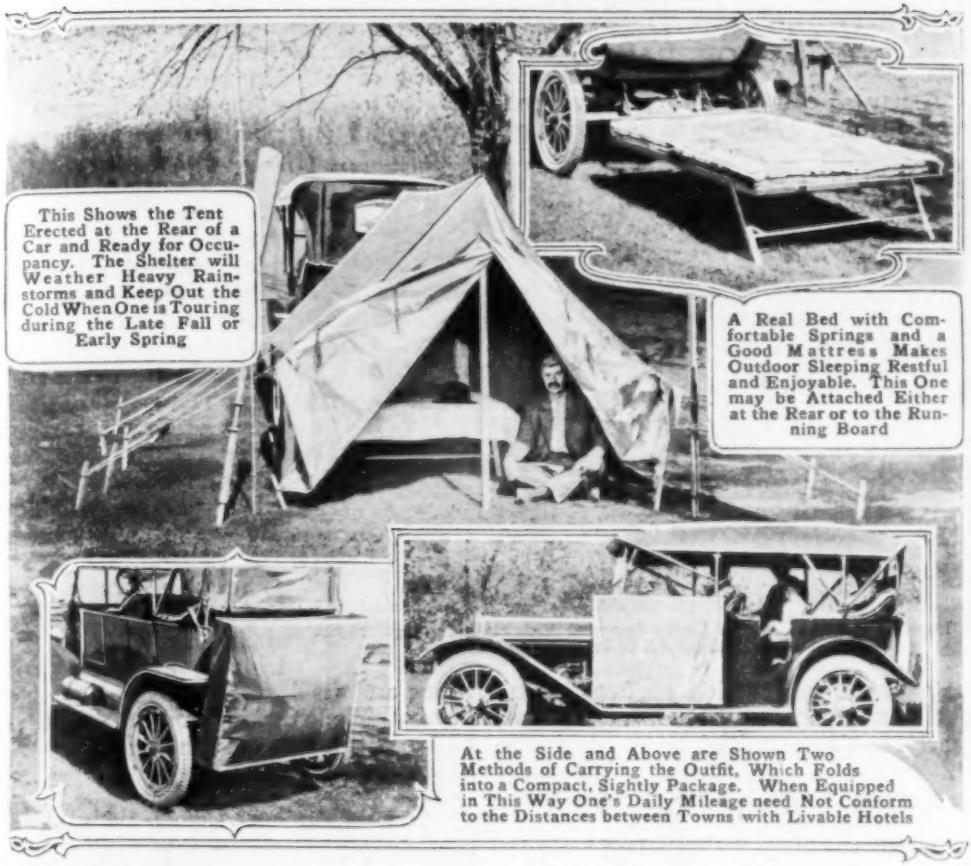
NEW MOTOR CULTIVATOR TESTED IN CORN BELT

During the past summer very satisfactory results were attained with a new power-driven cultivator which was tried out under actual working conditions in the Corn Belt. Although fundamentally a cultivator, the machine can also be employed in about the same capacity as a light tractor for various farm purposes. It is expected that its cost, which has not yet been determined by the manufacturer, will be about equal to that of three first-class horses. The cultivator is of the two-row type and works at speeds varying from one-half to three miles an hour. A single caster wheel supports the weight at the front, while two 42-in. drive wheels with 6-in. faces are employed at the rear. Angle-iron cleats may be fastened in place quickly when needed so that traction can be obtained on almost any kind of soil. The two rear wheels are driven separately, enabling one to be held stationary while the other is revolved forward or backward. This allows the machine, which has an 84-in. wheelbase, to turn around within its own length. A four-cylinder motor, cast en bloc, is mounted on a substantial steel frame attached to that of the cultivator. The driver's seat is at the rear within convenient reach of the steering wheel and operating levers. The gangs are operated with the feet in the customary manner.

MOTOR-CAR CAMPING OUTFIT CARRIED CONVENIENTLY

For those motorists who care to make the most out of a touring junket and enjoy the full delights of outdoor life instead of making runs from one hotel to another, a portable automobile camping outfit of very compact and comfortable form has been introduced. In one instance it consists of a 7 by 9-ft. tent and a good spring bed, fitted with a cotton mattress, sufficiently large to accommodate two persons. The tent poles are hinged so that they, along with the ropes and stakes, may be placed with the rest of the equipment when it is packed. The bed is hinged at the middle and folds in half

The Rear Wheels of This Cultivator are Driven Separately, Enabling One to be Held Stationary While the Other is Revolved



This Shows the Tent Erected at the Rear of a Car and Ready for Occupancy. The Shelter will Weather Heavy Rainstorms and Keep Out the Cold When One is Touring during the Late Fall or Early Spring

A Real Bed with Comfortable Springs and a Good Mattress Makes Outdoor Sleeping Restful and Enjoyable. This One may be Attached Either at the Rear or to the Running Board

At the Side and Above are Shown Two Methods of Carrying the Outfit, Which Folds into a Compact, Sightly Package. When Equipped in This Way One's Daily Mileage need Not Conform to the Distances between Towns with Livable Hotels

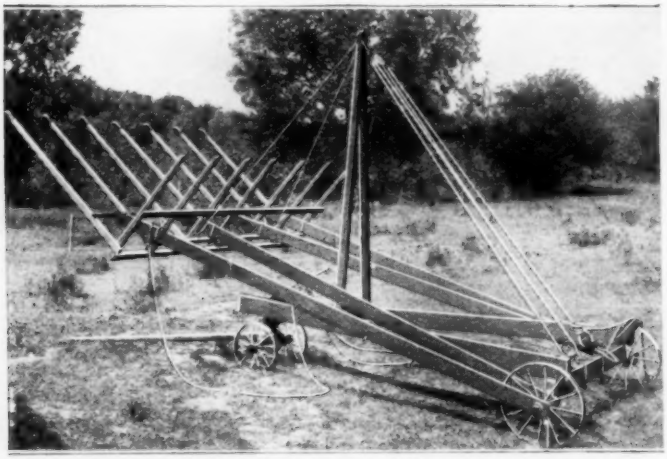
its length, while one end is secured to the running board, or rear, of a car so that when its waterproof case is removed it can be let down like an ordinary folding bed. The tent can be pitched and everything made ready for the night in a few minutes. Eighty pounds covers the weight of the whole thing. When accommodations for four persons are required, a larger tent and two beds are available.

SHUN INFANTILE-PARALYSIS CURES, WARNS GOVERNMENT

All alleged remedies for infantile paralysis should be regarded with the utmost suspicion and avoided, according to a warning that has been sent broadcast by the government. So far no medicinal cure has been found for the malady, which has assumed startling proportions at New York and caused anxiety elsewhere. When serious epidemics spread over the country, fraudulent remedies which are often not merely worthless, but positively dangerous, frequently make their appearance in wholesale quantities. For this reason Federal food and drug inspectors have been directed by the Department of Agriculture to maintain a vigil for interstate shipments of concoctions purported to alleviate or cure infantile paralysis. When apprehended, and some already have been, the makers of these fake medicines will be prosecuted. Insomuch, however, as unscrupulous persons are able to dispose of their so-called remedies within the state in which they are manufactured without coming within the jurisdiction of the Federal laws, the public is admonished to be wary, for in such cases protection is afforded only by state laws.

PORTABLE HAY STACKER IS EASILY OPERATED

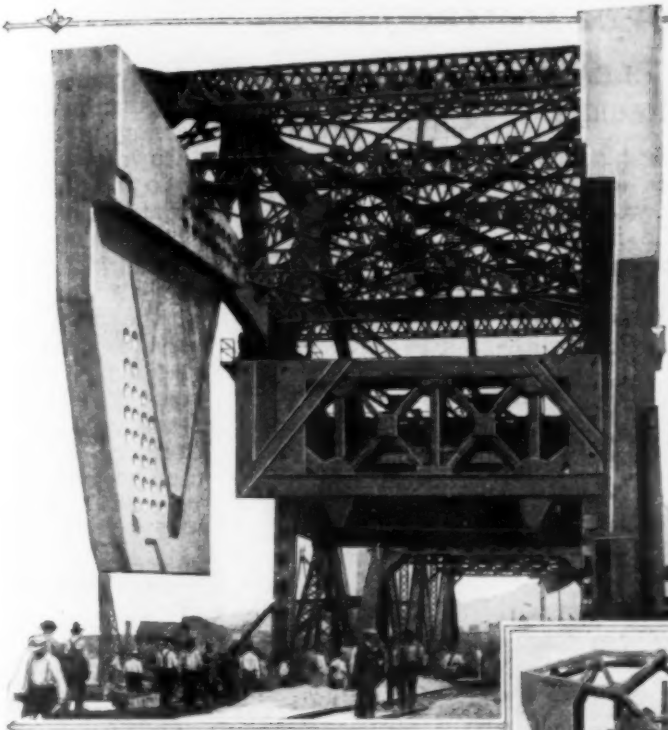
A hay stacker which is easily operated, is narrow enough to pass through farm gates, and which scatters practically no hay, has been invented recently. It is mounted on a low four-wheeled truck. The tilting head or rack on which the hay rests is composed of wooden strips set at right angles to each other and is fastened to the upper ends of two long supports. These are attached at their lower ends to the rear axle. The rack is raised by means of block and tackle connecting the rear of the truck with the upper end of a narrow frame which in turn is pivotally fastened to the truck at its lower end. Rods connect the upper end of this frame with the free ends of the supports on which the rack is mounted. When the rack has been drawn to the desired height it is tripped by means of ropes and its load is delivered upside down. The stacker can be operated either with or against the wind.



A Hay Stacker That can be Easily Operated Either with or against the Wind and will Deliver All of Its Load to the Stack

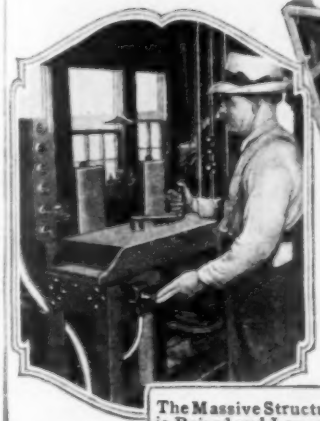
MASSIVE BASCULE BRIDGE COMPLETED AT CHICAGO

One of the largest single-leaf bascule bridges ever constructed in this country has recently been placed in operation at Chicago by the Chicago and North Western Railway. The extreme length of its movable span, which carries three tracks, is 186 ft. Exclusive of the engine, motors, and the operating equipment, the structure contains 2,782,600 lb. of steel and is counterbalanced by massive weights totaling 2,360,000 lb. Two 150-hp. electric motors are capable of lifting the bridge through a vertical angle of 87°, opening it to its full height in one minute. For emergency purposes a 50-hp. gasoline engine is installed. With this the bridge could be raised and lowered in case the current or any of the electric machinery should fail at any time. Essentially the operating mechanism consists of complete electric and mechanical-control systems, locks, brakes, and emergency equipment. All of the signals are interlocked with the bridge-control mechanism so that the structure cannot be opened until the former are properly set. The bridge replaces a two-track structure of the center-pier revolving type constructed in 1887. Although it spans the north branch of the Chicago River at the same point crossed by the old bridge, neither railway nor river traffic was interrupted, except for a few hours immediately preceding the completion of the work, when the old structure was cut into sections and quickly removed, the new one lowered into place, and the approach tracks elevated and alined. Service over the old bridge was maintained, until within a few hours of the time the new one was opened, by erecting the movable span in an open position and allowing trains to pass through the lower part of it while the construction work was in progress. In all traffic was halted only 18 hours.

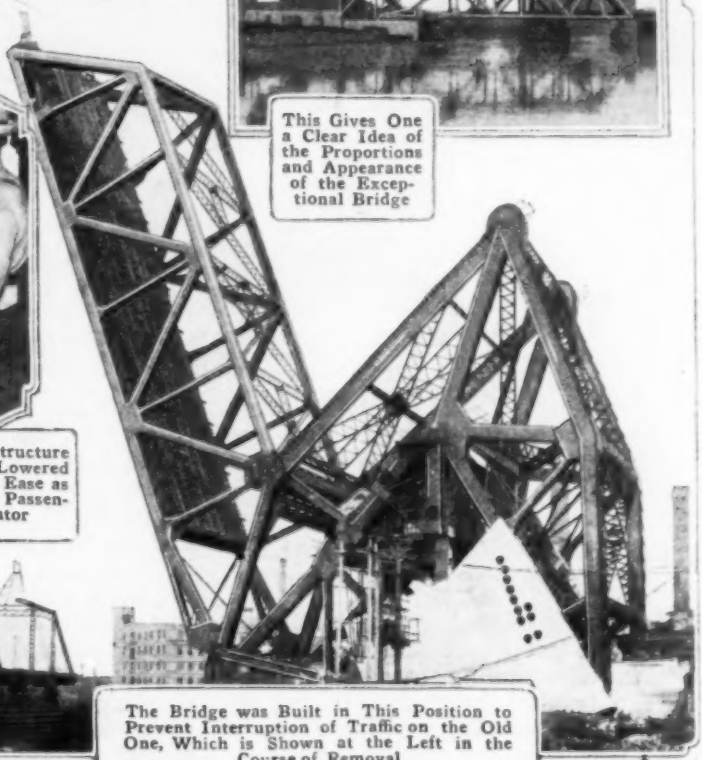


Putting the Finishing Touches to the Great Bascule Bridge over the North Branch of the Chicago River: This Shows the Great Structure After It had been Lowered into Position. Workmen are Engaged in Alining the Approach Tracks and Getting Everything in Readiness for the Resumption of Traffic

This Gives One a Clear Idea of the Proportions and Appearance of the Exceptional Bridge



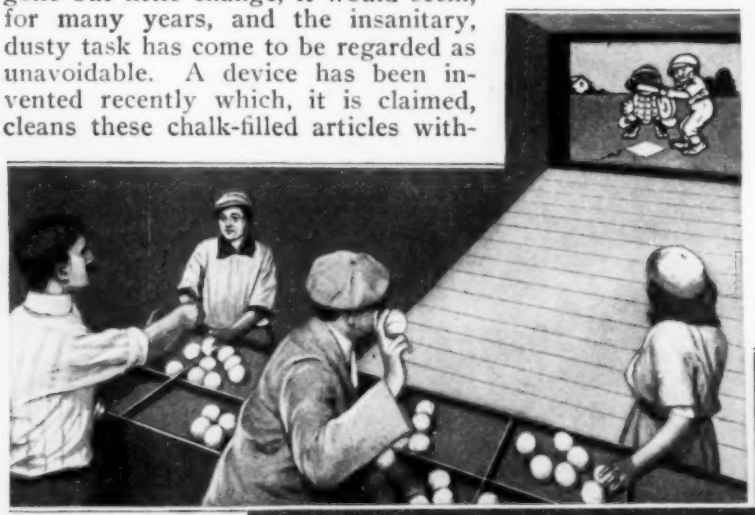
The Massive Structure is Raised and Lowered with as Much Ease as an Ordinary Passenger Elevator



The Bridge was Built in This Position to Prevent Interruption of Traffic on the Old One, Which is Shown at the Left in the Course of Removal

VACUUM DEVICE CLEANS BLACKBOARD ERASERS

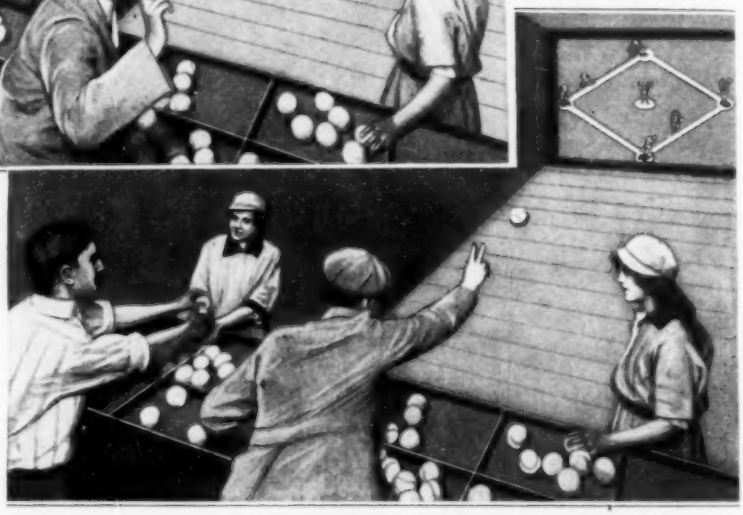
The manner in which blackboard erasers have been cleaned has undergone but little change, it would seem, for many years, and the insanitary, dusty task has come to be regarded as unavoidable. A device has been invented recently which, it is claimed, cleans these chalk-filled articles without raising choking clouds of fine dust. It is designed on the principle of the vacuum cleaner and is operated by a 1/25-hp. motor which can be connected with any light socket. A stiff revolving brush engages the surface of the eraser and removes the dust, which is drawn off into a bag.



A New Attraction for Carnivals and Fairs: If a Spectator Throws a Strike the Stationary Picture Shown Automatically Becomes a Motion Picture and Shows the Batter Running for First Base

PATRONS OF "MOVIE" BALL GAME DO THE PITCHING

A novel patented game, conducted somewhat after the manner of the familiar cane-ringing stands and affording a patron all the zest of sharing actively in a baseball game, has recently been perfected by employing special devices in connection with presenting a motion picture of a ball game. On what appears to be a regular motion-picture screen a projecting machine, about 25 ft. distant, throws a picture of a batter stepping up to the plate in front of a catcher, both facing the spectator. When the batter arrives at the plate the picture becomes stationary until some patron steps up to the counter, set at the proper distance, and throws a ball toward the pictured batter. If the throw is accurate enough to be called a strike, its impact against the screen automatically starts the projector, which shows the batter striking and running toward "first." The field is then shown, with all the infield at the bases and facing the spectator. If the patron can throw the ball accurately to the pictured first baseman, its impact will again stop the projector, showing the exact position of the runner and displaying a light. After one second the runner is shown resuming his run around the diamond.



If the Spectator Is Able to Hit the First Baseman's Mitt Before the Runner Reaches the Base, the Picture Projector Stops and the Runner is Considered Out

COMMENT AND REVIEW

ISN'T it a bit of a paradox, after all, that such a war as is now raging would be impossible but for our advanced civilization? The material things which have most contributed to the world's advance and developed the remote places, turning deserts into farms and pestilential marshes into towns, have in turn made possible the conflict of millions.

Civilization Assisting War

Without modern vehicles of transportation, including railways and motors, for the movement of men, munitions, and supplies, such vast armies would advance only to exhaust their ammunition and starve. The short sword and spear needed only the arm to wield them, but machine guns and cannon have fearful appetites. Take away the telegraph and telephone, and the machinery of a war department would instantly clog and become one gigantic chaos; the stronger it had been, the weaker it would become.

Except in the hospital service, science and invention have apparently been employed chiefly to make a war so vast and deadly as to leave little of awfulness to the imagination.

FLORIDA, with good claims for the oldest settlement in this country, is one of the newest states in point of development. Perhaps it were more accurate to say has been one of the newest, for the past few years have worked changes almost magic. To the visitor there is an endless variety to enjoy. The live oaks which were young when Christ was born, their branches pendent with hanging moss; palms by millions, lofty pines, giant cypresses, and all manner of wonderful semitropical growth, blend their odor with ocean breezes. Miles upon miles have been cleared, and where recently existed an almost impenetrable jungle have appeared rich farms, producing two and three crops per year. Orchards of orange and grapefruit and plantations of pineapple lend charm and variety to the summer day in winter months. Land that has been gathering rich deposits of dying vegetation for tens of thousands of years, and which rivals the fertility of the Nile and Euphrates, has been drained to grow early fruits and vegetables which find a welcome market in the snowbound North. Camphor and indigo, cocoanut and pecan, find conditions favorable to their growth. Hundreds of lakes and rivers are alive with fish and ducks; in the woods are game; a thousand miles of shore on ocean and gulf afford sea bathing in January; the winter climate rivals that of the Mediterranean. In most states the hunting season begins as the tourist season ends, but in Florida this is reversed and the sportsman has both fresh and salt-water fishing all winter, with abundance of ducks, geese, quail, wild turkey, deer, and bear, within an hour's ride from his hotel. If he enjoys yachting and motorboats, 2,000 miles of inland sheltered waters invite him every day in the year.

Through Avenues of Palms

Nearly half the population of the United States are within a 24-hour journey by rail of this land of sunshine. A million people living where snow falls in winter could, and in the near future will, enjoy this vast pleasure ground each year. The one thing which has stood between this promised land and many thousands of winter visitors has been the absence of good roads. There have been stretches of good roads, but separated by links which were anything but a joy to motorists. Now this is rapidly changing. County after county has voted road bonds by the million dollars, and the state is being crossed in all directions by paved highways on which the tourist can do his 200 miles, or more, in a day, in comfort. The states leading north and northwest are also providing state roads which rival those in the North, and the vast procession of cars which passed into Florida the past winter carried license signs of probably every state in the Union. These license signs, by the way, serve as a first aid to new acquaintanceship, and the spirit of comradery which pervades Florida renders it very easy, especially for visitors from the same state, to make new friends. It is no unusual sight to see several cars from different parts of the same state touring together, whose owners had never met before.

Already over $12,000,000 has been appropriated—one county alone is spending $1,500,000, and others a million each—for paved highways. No other state affords so many miles of motor roadway bordering ocean, gulf, rivers, and lakes. The automobile tourist literally rolls along through avenues of palms.

The Melting Pot of War

PERHAPS not so extensive a mix-up as that of the historic confusion of tongues at the Tower of Babel, but nevertheless an intermingling of people previously unknown to each other, is transpiring on a gigantic scale. Hundreds of thousands of men are in lands foreign to their own, for the first time in their lives. Not only are the lands strange, but the people and the architecture; while native foods and manner of living differ radically from those at home.

Especially strange is everything to the troops from far-away lands, just as these foreigners are themselves strange to their own compatriots and the citizens of the places in which the fortunes of war dispose them.

Hindus in France, and French in Germany; Germans in France, Malta, Russia, and Turkey; Russians in Germany, France, and Austria, and Austrians in Russia; Hungarians in Russia and Italy; Italians in Austria; and English in Germany, France, and Turkey. What a kaleidoscope of humanity!

Then, too, there are the hundreds of thousands of prisoners of war. Compelled to remain and live with their avowed enemies, there is nevertheless the inevitable broadening of mind in the discovery of those good traits which even the worst of us possess. And the wounded prisoner, stretched side by side with those he so recently fought, as the days go by and he finds himself sharing to the fullest

extent the best conditions can afford, cannot fail to recognize, to some extent at least, the spirit of generosity and be softened thereby. The fact that the qualities of good in those we know but slightly, or not at all, are unseen, is largely responsible for the hatred which is unnatural and wicked.

When that glad day comes in which the entire world will rejoice at the ending of the struggle, and the armies disband and scatter to their homes, it is certain there will be carried back many memories not altogether hateful. Into each hamlet, however small, will return one or more, to tell the story of how people look and live in those other hamlets they have visited. And thus, as with a mammoth mixing machine, will the people as a mass realize in some degree the fact that no one people has exclusively all the qualities, either good or bad. At the moment, those actively engaged in the combat and heated with the strife of conflict can hardly be expected to contemplate the enemy with composure, and some things will never be forgiven in the present generation; nevertheless, the melting pot of war must surely burn out some of the dross of ignorance and suspicion.

Count the Cost

OF the many nationalities the American most of all disdains to count the cost. There are, to be sure, New England villages and towns where old-fashioned thrift and prudence do count the cost, and in doing so often go to the other extreme. But the generally accepted type of American is inclined to be careless and thoughtless when it comes to spending his money; and of rigid self-denial he is not a notable example.

Naturally this tendency, or possibly it has even become a trait, is carried into his business, and so of late we hear much about efficiency and "costs." Everything we possess has its cost price, but the trouble is we too often fail to take into consideration what this cost is. The large enterprises, where the small fraction of a cent means success or failure, have already learned their lesson, but there still remain thousands upon thousands of smaller business houses who refuse to seriously consider "costs." Perhaps the most effective illustration of this fact is that out of a total of some 22,000 business failures last year only 2,000 had any recognized knowledge of business or made use of a competent cost system. There will always be failures in spite of any and all cautionary methods, but the example that ten out of every eleven failures were selling in ignorance of what it cost them to do business cannot be overlooked. A cost system in a small business does not mean a lot of red tape and extra clerks, but it is just as essential to success. Some mighty astounding surprises are uncovered when an analysis of even a successful business is made, and many undreamed-of leaks are exposed.

August 25, 1916 H. H. WINDSOR

REDUCING AND MASSAGING APPLIANCE

A new machine for massaging the abdomen and reducing the waistline

A Device for Massaging the Abdomen and Reducing the Waistline, Which is Operated by the Patient Himself

has been invented, which is operated by the patient himself. It consists of a white-enameled plate, or head, which is pressed against the body, gearing that imparts motion to this head, two hand cranks by which the machine is operated, and a white-enameled case inclosing the gearing, etc. The device is designed to be hinged to the wall and is fastened to a slotted frame in which it can be raised or lowered to the desired height. As the patient leans against the projecting end and turns the cranks, the head applies a peculiar kneading massage, not by revolving but by successive portions of its rounded edge pressing into the body and thoroughly stimulating the whole region treated. The speed at which the appliance is operated depends on the exertion of the patient.

MINE BUREAU PERFECTS FIRE-DAMP DETECTOR

The Bureau of Mines has recently perfected what it regards as the first really accurate device for detecting the presence of inflammable gases in the air. Being simple and durable and capable of registering $\frac{1}{10}$ of one per cent of fire damp present in the air, the instrument will doubtless become one of the most valued safety appliances used in mines. The detector consists essentially of a U-tube of glass, one end of which is open and the other surmounted by a small chamber closed by a valve. In this chamber is a tiny platinum wire coil which may be heated intensely by turning on a battery current. The operator blows gently into the tube, which is filled with water, forcing the water into the chamber and expelling the air; then the tube is closed. When a test is about to be made it is opened and as the water flows back to its normal level it sucks tainted air into the chamber. The chamber valve is then closed and the current turned on. This burns up the inflammable gas in the sample of air. The lessened volume of the sample, or it might be called the lessened pressure which results from combustion, permits the water in the tube to fall, and the proportion of gas that was present is shown on a graduated scale.

A Simple Device with Which One Is Able to Detect Even a Very Small Percentage of Fire Damp or Other Gas in the Air

By Using Two Screens Side by Side, as Here, Subtitles or a Running Story can be Carried on One of Them to Explain the Various Scenes Comprising the Film Projected on the Other

FILMS AND CAPTIONS SHOWN ON SEPARATE SCREENS

In the social-service department of one of the large manufacturing plants at Dayton, Ohio, where motion pictures are employed for educational and entertainment purposes, two screens are used instead of one. This scheme, with the aid of an extra projector, permits the various subtitles to appear on one screen while the picture is shown uninterruptedly on the other. In the case of an illustrated lecture entailing the use of either films or slides, the plan has been found advantageous. By arranging automatic slide-feeding devices which can be controlled by means of push-button switches placed in the hands of a lecturer, the changes can always be made promptly and without error. When films are shown, subtitles on slides can be changed in the same manner from the speaker's platform, if desired. When travelogue and similar films, needing more or less explanation, are shown, a running story can be carried on the extra screen.

MAGNETIC-IRON MONUMENTS LOCATED WITH COMPASS

Magnetic-iron monuments for marking the location of property lines are recommended to surveyors and property owners because of the ease with which they can be located even though imbedded some distance in the earth. A desirable magnetic-iron monument for marking initial corners is a rod not less than 1 in. in diameter and 36 in. long. It should be driven with light hammer strokes, thereby increasing its magnetism. When searching for such a monument it is unnecessary to tear up the paving or sidewalk in the vicinity of the rod, for it can be located with a small needle compass.

SWIFT AMERICAN AEROPLANE HAS NO EXPOSED WIRES BRACING WINGS

HEREWITH is pictured one of the most interesting aerial vehicles of recent development. It is a new Curtiss model that has lately been put through a series of remarkable test flights over a measured course near Buffalo. The most striking feature it presents is the total absence of exposed wires. By substituting two streamline wing posts for the customary bracing strings, the head resistance of this craft has been reduced so materially that it has been able to establish a new world's speed record for planes of 100 horsepower. It has been driven at the rate of 119 miles an hour, and after some slight changes are made, it is confidently expected that a speed of not less than 125 miles an hour will be attained. The lower plane is very short, but sufficient supporting area is provided to make the aeroplane one of general usefulness, not merely a speed machine. During the tests it has been found that the craft responds quickly to the various demands of the pilot. It possesses what is described as remarkable inherent stability and also manifests exceptional climbing powers. The design is expected to prove of great importance in the aeronautical world.

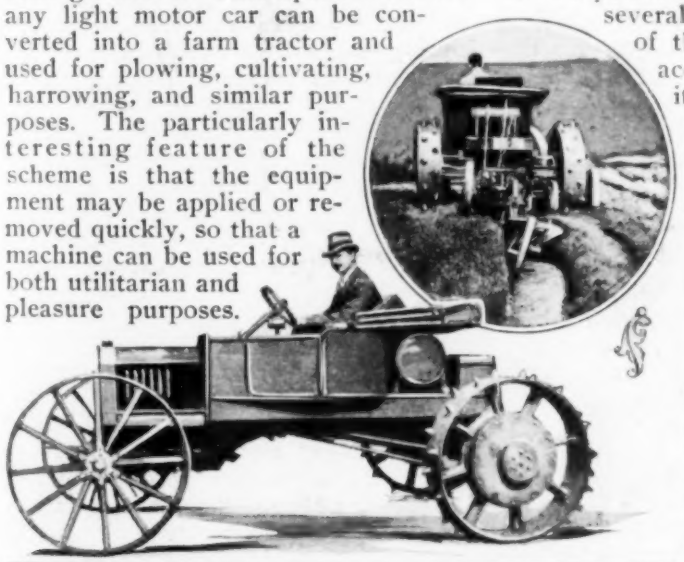
HEADER WHICH ATTACHES TO FRONT OF TRACTOR

A new heading device, which is used in harvesting wheat, is so designed that it can be attached directly to the front of a tractor. Heretofore the effectiveness of a tractor in harvesting this grain has been minimized because horses are commonly used to push the headers. The new device, which can take turns at full speed, saves much of the wheat that formerly was lost, it is claimed. The cost of this header is only about half that of the regular machines. Another important feature possessed by it is that it can be attached to a tractor in about 30 minutes. Because of the increasing demand for farm tractors there is a large number to whom this invention will appeal.

A New Wheat Header Designed to be Attached to the Front of a Tractor Instead of being Pushed by Horses. With This Device Turns can be Taken at Full Speed

OUTFIT CHANGES MOTOR CAR TO TRACTOR OR TRUCK

By means of a special outfit, or set of parts, for which patent rights have been granted a Minneapolis inventor, any light motor car can be converted into a farm tractor and used for plowing, cultivating, harrowing, and similar purposes. The particularly interesting feature of the scheme is that the equipment may be applied or removed quickly, so that a machine can be used for both utilitarian and pleasure purposes.



A Motor-Car Converted into a Tractor. Above, at the Right, It is Shown at Work in a Field

Furthermore, if it is desired, truck wheels can be applied to the rear axle and the car used instead of a wagon or as a road tractor. The rubber-tired wheels are replaced with large metal ones and a chain-and-gear driving system employed. The power is applied at two points opposite each other and several inches from the center of the bull wheel, so that, according to the inventor, it is not necessary to use roller bearings to take up the strain. A liberal road clearance is given and all gears incased in oil. It requires but 30 minutes to change almost any small car into a tractor capable of pulling two 14-in. plows. In another 10 minutes truck wheels can be applied. The speed of the fan is increased and a circulating pump installed. The outfit includes a belt attachment which enables power to be transmitted to various farm implements, such as separators, balers, and corn shellers.

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FUNERAL PROCESSION OF "STRONG MAN OF CHINA"

MUCH pomp attended the funeral of Yuan Shih-kai, president of the Chinese Republic and popularly known throughout the world as "the strong man of China," who died June 6 in the palace at Peking following a brief illness brought on by nervous disorders. Mystery shrouded his demise and caused the circulation of many wild rumors, some of which attributed his death to suicide, and others to poisoning by revolutionists. The accompanying picture was made during the funeral ceremonies and shows the catafalque being carried on the shoulders of pallbearers through the streets of the capital at the outset of its journey to Changteh, where the burial took place. The line of march through Peking was flanked on both sides by solid rows of soldiers. Priests of the Lama chanted the services, and sacrifices were offered by many of the native officials. Yuan Shih-kai was 57 years old at the time of his death and has been succeeded by Li Yuan-hung, the vice president.

TIRE TUBE IS WATER RAFT FOR HEAT REFUGEES

There is more than one function to which the tubing of a motor-car tire can be put, as was evinced at some of the beaches at Chicago and other points during the hottest days of the past summer. It was not an uncommon thing to see inflated tubings employed to buoy small youngsters in the water, and just as frequently, too, these devices were used by men and women as pneumatic rafts, or cradles, as one is pleased to call them. By lying across one of the tubes so that it passes beneath the back of one's neck and knees, folding close to each side of the body, a bather may recline in the water and float to his heart's content without even so much as moving a thumb or toe. When the water is quiet the pleasure is increased.

PHOTO BY AMERICAN PRESS ASSOCIATION

Here Is a New Use for the Tube in the Idle Extra Tire on the Back of One's Motor Car: It Gives a Child or Inexperienced Swimmer a Chance to Float Better than a Professional

A SURVIVOR'S STORY OF NORTHERN ONTARIO'S DISASTROUS BUSH FIRE

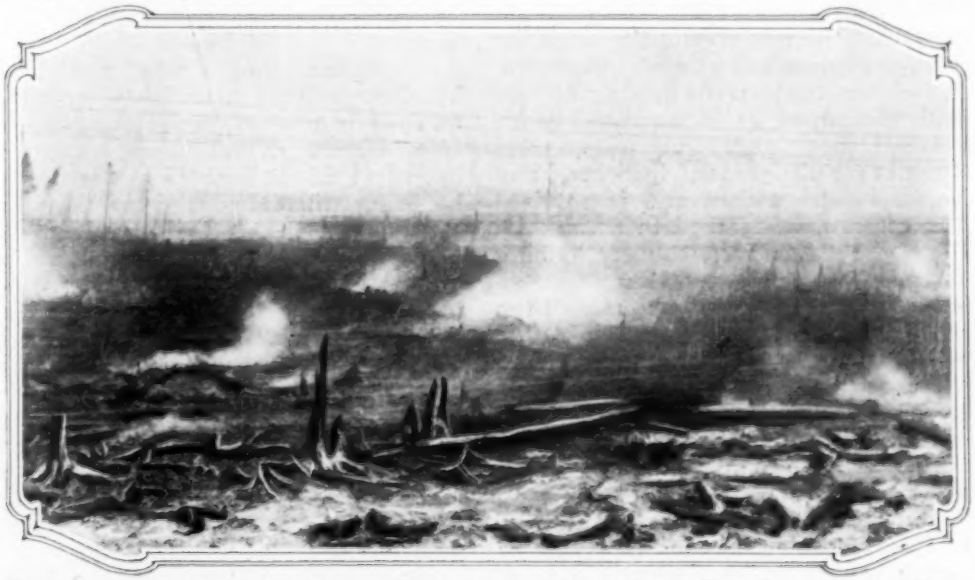
By WILLIAM C. H. DOWSON

THE following simple narrative of the bush fires that recently devastated a section of Ontario, Canada, is told by one of the survivors. Mr. Dowson came through the fire lying face downward in a potato patch a mile from where the town of Matheson stood before it was flame-swept. In a letter, he says: "The smoke and heat were awful, and I never expected to see another sunrise, but I did and so did my chum and his mother, a woman of sixty, who were with me." In point of destruction the northern Ontario fire ranks third in the history of America. It swept across 1,200 square miles of forest and farm land, leaving six towns in ruins, and scorching out the lives of 250 men, women, and children.—Editor.

ON Saturday, July 29, 1916, after nearly two months of exceptionally dry weather, a high wind arose and gradually increased until it blew nearly 80 miles an hour, fanning into flames the smoldering remains of settlers' burns. These spread, and uniting in one great wall of flame hundreds of feet high, it swept the country from Cochrane, the junction point of the Temiskaming and Northern Ontario Railway and the National Transcontinental Railway, south to the small village of Bourkes, a distance of nearly 90 miles. The only town of importance which escaped entirely was Monteith, it being saved by the government experimental farm, which lies to the west of the town.

When the fire was seen to be approaching Matheson the men all turned out to fight it, and try to save the town. But at four in the afternoon the wooden freight sheds at the west of the station caught fire, the angry flames leapt across to the station, then with a terrible roar the whole town began to burn, the flames leaping from building to building with such rapidity that within five minutes the town was a veritable inferno. But there was no panic—the strong helped the weak, the men putting the women and children on a freight train that had been held for the purpose. When all that could, some being cut off by the fire, were aboard, certain of the men went with the train to help the crew get it through the fire, and although the smoke was so dense that it was simply impossible to see more than a few yards, and the heat was terrific, the brave crew took their train through over 20 miles of this hell to safety, saving the lives of 90 persons, the majority being women and children.

The men who stayed behind, and a number of persons who were unable to



The Black Ruin Left in the Wake of the North Ontario Field and Forest Fire. Twelve Hundred Square Miles were Devastated

get to the train, were forced to seek safety on the bridge, which is about 200 yards long and crosses the Black River at Matheson. The heat and smoke was

All That was Left of Matheson, One of the Most Thriving Towns in New Ontario

so intense that it drove them to one end of the bridge and here a hundred or so persons spent the night, expecting every moment would be their last.

Sunday morning Matheson was a smoldering heap, with anxious persons going hither and thither looking for missing friends and relatives, but things had been so well organized that not a life was lost in the town itself. That the outlying districts had not fared so well was soon discovered, for refugees began to come into the town, those who could walk coming in first with the news. Help was quickly organized, the few surviving wagons and buggies were gotten together, and horses, with patched and improvised harnesses, were hitched to them. All day these scoured the country looking for and bringing in the wounded. To make their work more difficult, all the culverts, which were made of timbers, had been burned out.

About three o'clock Sunday afternoon a repair train passed through Matheson, having hastily repaired the tracks, which in places were twisted two feet out of line by the intense heat. Following it came a relief train with food and clothing sent by the people of North Bay, Cobalt, New Liskeard, Halfway, and other towns in the near vicinity of the fire. These supplies were very welcome to us, as most of us had lost all but the clothing we had on.

Monday morning a searching party went to look after the welfare of five families who lived on what is known as the north road, and from whom there had been no word. They discovered them, 25 in all, in the ruins of a small root house, burned almost beyond recognition. When search parties got through to the Crœsus Mine, one of the famous Monroe mines, they found it in ruins, and of the 35 men who were there at the time of the fire, only nine survived.

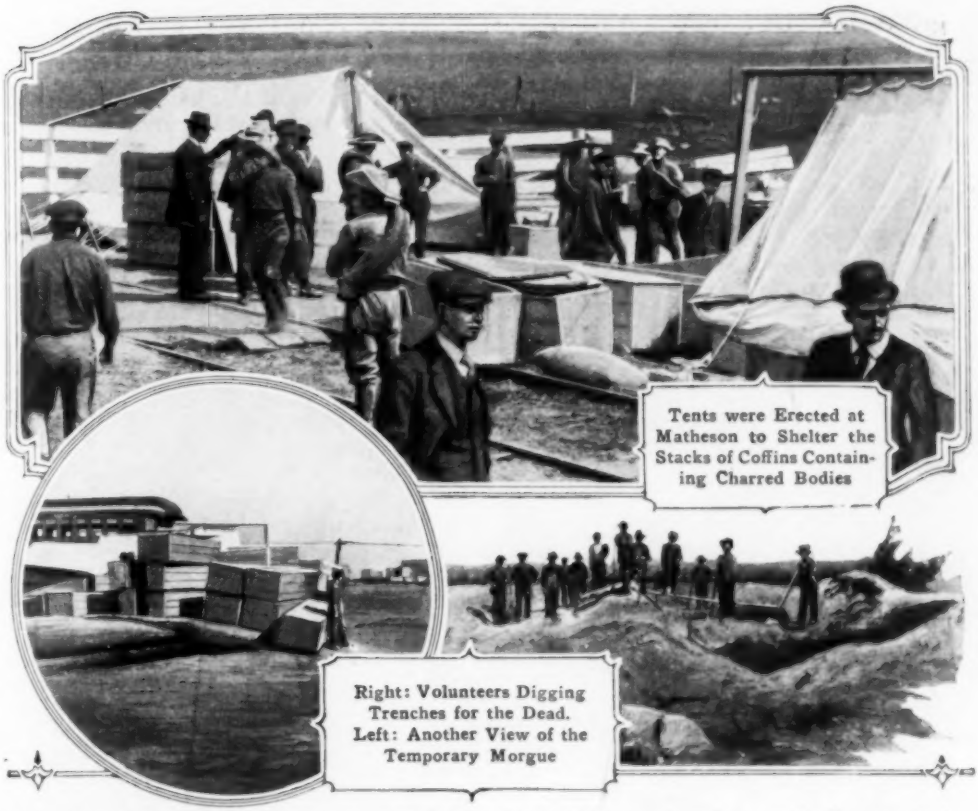
In Nushka, a small French-Canadian village a few miles north of Matheson, at the time of the fire there were 67 people—two survived.

On the relief train came numbers of caskets and an undertaker with his assistant. They erected a temporary morgue at the railway crossing in Matheson. The bodies from the surrounding districts being brought there, and placed in caskets, were either shipped away or carted to the burial grounds on the hill. Here gangs of volunteers were busily digging long trenches to receive the caskets. In these trenches the Rev. Mr. Conn buried, in three days, the bodies of 70 victims.

In the meantime a relief restaurant had been started in the show building on the fair grounds, meals being served free. Luckily it, and five other houses, had survived the fire. They were saved by being situated on the far side of a strip of low wet ground on which the fire could get no hold.

The militia department had sent us tents and blankets from Camp Borden. Some of these were rigged up as a refugee camp, the remainder being given out to us settlers as a shelter for ourselves until we can build a house with the lumber the government is giving us, it being impossible to build a log house now on account of the scarcity of suitable logs, the fire having made a clean sweep.

By Saturday, August 5, the town council and a squad of soldiers under



Tents were Erected at Matheson to Shelter the Stacks of Coffins Containing Charred Bodies

Right: Volunteers Digging Trenches for the Dead. Left: Another View of the Temporary Morgue

the direction of government officials, had things well in hand, the relief work being so well organized that we were able to get plenty of supplies for the asking.

At the time of writing, just two weeks after the fire, a new freight shed has been erected, and other buildings, both public and private, are fast taking shape in Matheson; also the towns of Pourquo Junction, Iroquois Falls, where the largest pulp mills in Canada are, Cochrane, and other towns are being rapidly rebuilt.

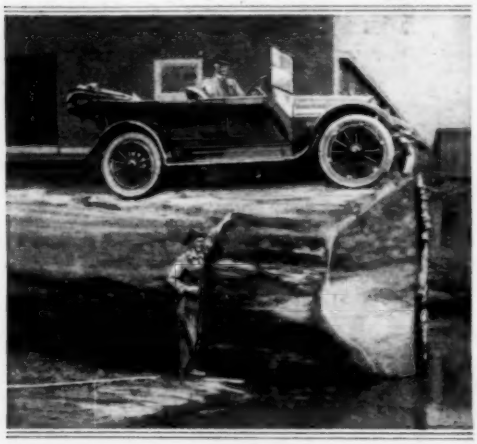
INVISIBLE VAPOROUS POISON USED BY GERMANS

According to advices reaching America from the eastern theater of war, the Germans have developed a new and very formidable weapon which is being used against the Russians. It is a poisonous, colorless gas, entirely unlike the chlorine heretofore employed, and so insidious that it gets in its work before being noticed. The character of the vapor is apparently unknown and there is seemingly no way of detecting its approach. The sole means of combating it is to wear respirators almost constantly when the wind blows from the enemy's trenches. The gas cloud settles close to the ground, rolling along instead of being wafted into the higher atmosphere, and is supposedly handled in the same manner as chlorine. When it reaches a trench, unless the men have taken the precaution to wear their masks, they become dazed and drop. Signals are then given and respirators are donned in the rear positions before the poison has been carried to them.

¶Recently a papal nuncio hoisted the papal flag over a vessel he had chartered to show that it was neutral. It is said this flag has never before flown over a vessel at sea.

GIANT FIR LOG IS AMPLE SUPPORT FOR CAR

There was recently brought to a Tacoma, Wash., sash and door mill a log so large that the manager of the plant



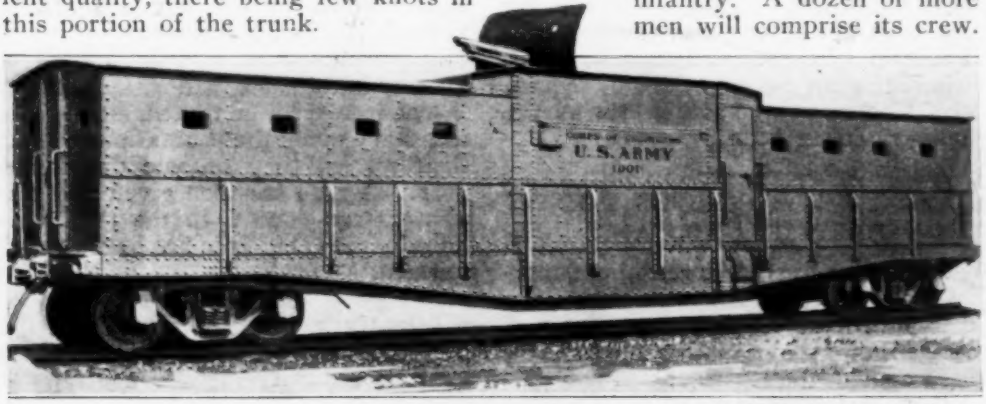
A Log So Large That a Touring Car was Driven Along on the Top of It without Difficulty

was able to drive his car on the top of it without the least difficulty, as shown in the accompanying illustration. This giant log was cut from a fir tree in Snohomish County, and measures 28 ft. long, 10 ft. in diameter at the butt, and 8½ ft. in diameter at the opposite end. Approximately 12,000 ft. of lumber was cut from the timber and made into sashes for windows, screens, and the like. The lumber which was sawn from this huge fir proved to be of excellent quality, there being few knots in this portion of the trunk.

NEW ARMORED CAR BUILT FOR ENGINEER CORPS

For the use of the engineering corps of the United States army, a new type of armored railway car has been constructed. It is protected with plate that will resist the fire of all ordinary portable arms, and is to be equipped with a 3-in. quick-fire and several machine guns. Except for its superstructure, the car is of the gondola pattern. Its interior is divided into three compartments. The lower part of the central one is intended as a magazine, while the upper portion forms a well for the fieldpiece. The end compartments are provided with an aggregate of 20 portholes through which rifles and machine guns can be fired. These apertures are approximately 7 by 10 in. in size and placed 4½ ft. above the floor. Immediately beneath each of the holes is riveted a swivel mounting to accommodate a machine gun. Slides are provided so that the openings can be closed completely when it is desired.

The car has been delivered to the War Department and is to be equipped at the Sandy Hook proving grounds. It is not designed for offensive action so much as for guarding railway lines and bridges, protecting forces engaged in the reconstruction of works ahead of an advancing column, and for the movement of troops past dangerous points. The car will accommodate, for quick transportation, a company of infantry. A dozen or more men will comprise its crew.



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Armored Railway Car of New Type Designed and Built for the War Department in Less than a Month's Time

WITH OUR BOYS AT THE BORDER AND IN MEXICO

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Above, Our Soldiers are Shown Constructing Adobe Huts to be Used as Barracks by Battery C, 4th Field Artillery, at Its Base in Northern Chihuahua. Streets have been Laid Out and a Small City Begun in the Desert. The Picture at Left was Snapped at an Improvised Shower Bath. The Boys Take Turns Pumping Water into the Barrel for the Bathers Below

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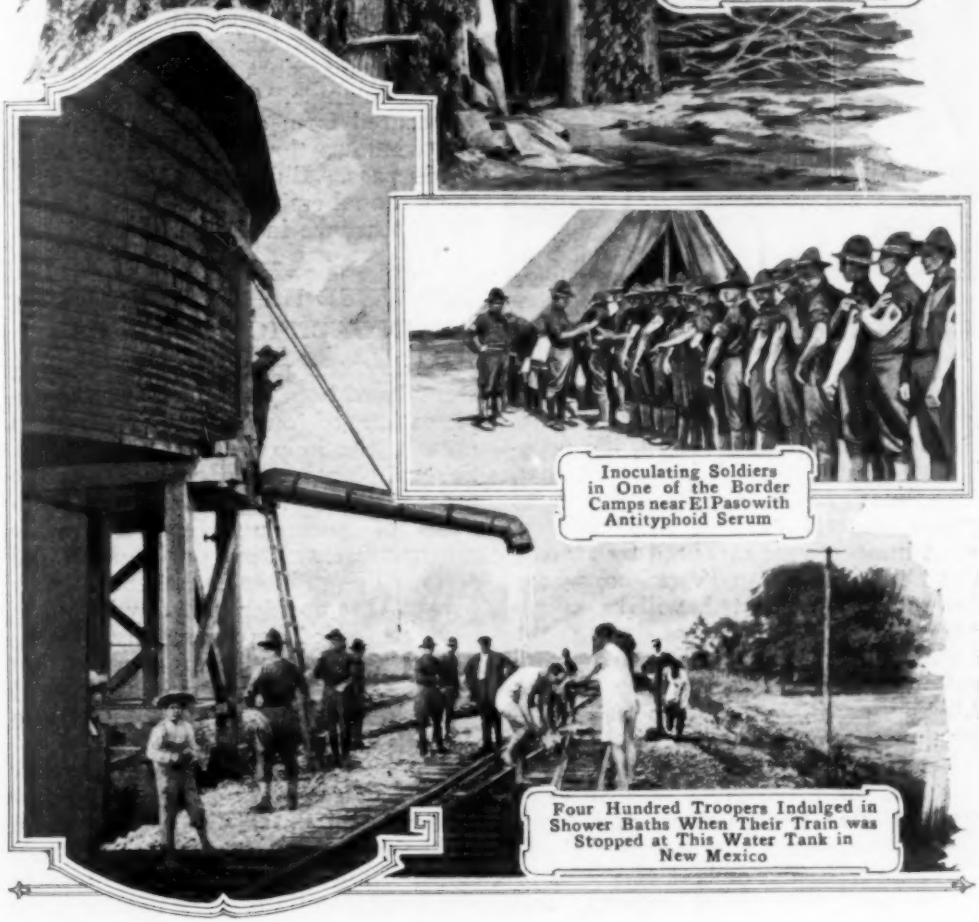
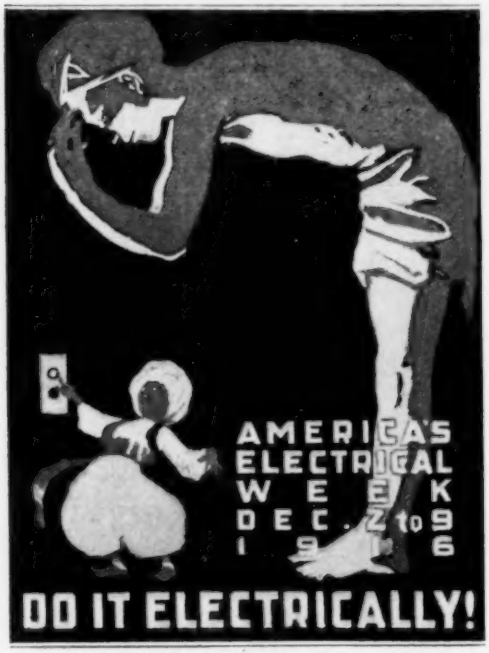
Inoculating Soldiers in One of the Border Camps near El Paso with Antityphoid Serum



Four Hundred Troopers Indulged in Shower Baths When Their Train was Stopped at This Water Tank in New Mexico

ALADDIN AND GENIE SHOWN ON WINNING POSTER

Approximately 800 different designs were entered by professional and amateur artists the country over in the "Electrical Week" poster competi-



Poster to be Used in Advertising Electrical Week the Country Over This Fall: The Design was Selected from Among 800 Contributions Entered in a National Contest

tion recently conducted by the Society for Electrical Development. It is claimed that this is a record, the number of participants being more than four times greater than in any previous poster contest held in this country. First honors were captured by Harold von Schmidt, of San Francisco, whose design, it is estimated, will be reproduced 200,000,000 times during the nation-wide electric-promotion campaign this fall. The poster depicts Aladdin pressing a button and summoning the genie who, instead of delivering precious stones and gold, provides the three great necessities of modern life: heat, power, and light. The placard bears the legend: "Do It Electrically." The judges consisted of artists and advertising experts, and voted unanimously for the winning design, which is simple enough that it can be reproduced in various sizes from that of poster stamps to bill posters of any number of sheets. The first prize was $1,000, and the second, $500, which was awarded to John A. Bazant, Bronx, New York. Six other prizes, aggregating $400, were also awarded.

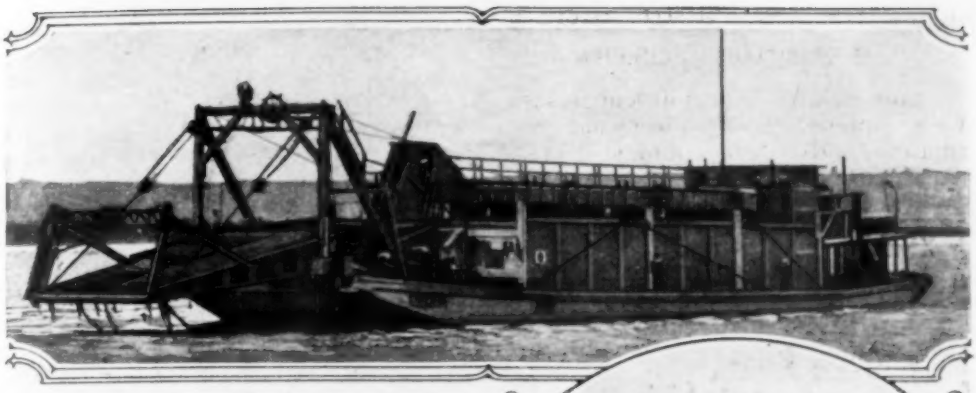
SIMPLE METHOD OF FLAG ILLUMINATION

A simple and very effective method of illuminating the American flag at night has been employed by a citizen of Schenectady, N. Y. On a pole projecting from his attic window hangs a flag, measuring 5 by 8 ft. On the roof of the porch below it, and so situated as not to be visible from the street, have been placed two 60-watt lights with reflectors which direct the artificial rays against both sides of the flag at an angle. Current for the bulbs is secured from a socket near one of the windows through which the lamp cords pass. Illuminated in this way, the national emblem presents a beautiful appearance in the darkness.

BIG WEED HARVESTERS USED IN PACIFIC KELP BEDS

During the past year encouraging steps have been taken toward the exploitation of our natural source of potash, the kelp beds of the Pacific. Several plants are in operation at the present time and producing small quantities of potassium fertilizer, while others are extracting pure potash and certain by-products for chemical purposes. One powder company is said to have expended approximately $1,000,000 in a plant and equipment at San Diego. This apparently is the largest single outlay that has been put into the enterprise.

As a result of this progress a number of very large harvesters have been constructed and put in operation. Some of these are capable of cutting and transporting to their docks 500 tons of wet weed at a time, while another type



Big Kelp Harvester in Use near San Diego Which Is Capable of Cutting and Storing Aboard 500 Tons of Wet Seaweed during a Single Trip

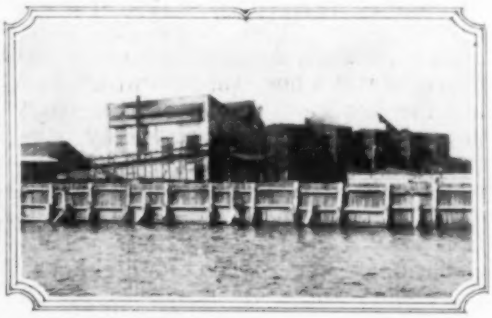
reaps the product and delivers it to lighters operating between the fields and the shore.

One of the former pattern has been built at a cost of approximately $20,000 by a Chicago packing company that for the past 18 months has interested itself in the utilization of the kelp beds. This device is 150 ft. long, 38 ft. wide, and supplied with dual engines developing a total of 500 hp. It navigates under its own steam, cuts a path 23 ft. wide and from 6 to 8 ft. deep, chops the kelp into small pieces as it is harvested, and stores it aboard in bins. The knives are secured to an endless chain that passes around a steel framework held on the adjustable inclined conveyor that extends over the prow of the craft into the water. This arrangement seems to be new, for usually reciprocating blades held in a horizontal cutting bar are used.

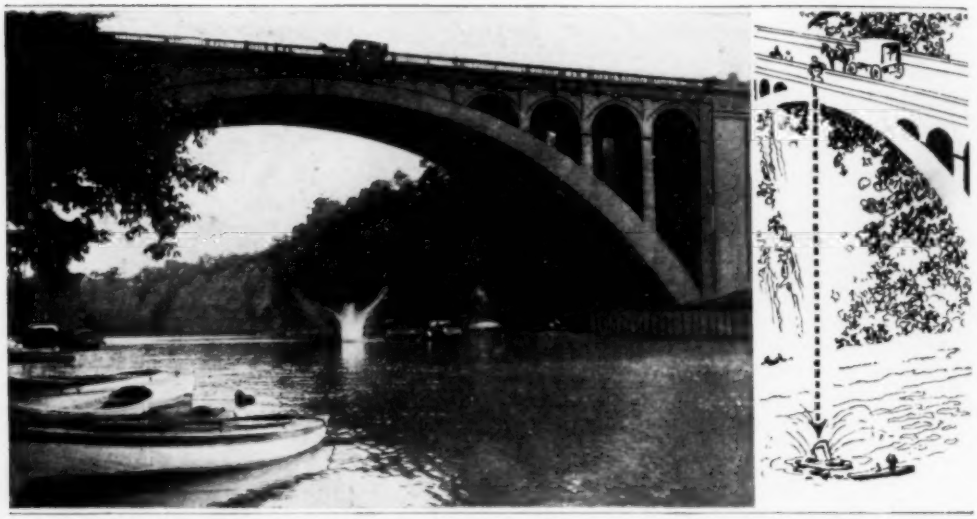
The Knives are Arranged on an Endless Chain Passing about a Framework Held at the Outer End of the Adjustable Conveyor at the Prow

Obviously, since the barge moves forward as the cutting is done, the kelp as it rises to the surface comes in contact with the conveyor and is carried on deck to the chopping knives.

The powder company previously mentioned operates four harvesters and eight lighters. In this case the seaweed is pumped to the lighters as it is cut and gathered.



At the Left Is One of the Lighters Plying between the Kelp Beds and Shore. As the Weed is Harvested It is Pumped into Tanks aboard the Craft. One of the New Fertilizer Plants is Shown at the Right



There Is a Report Like That of a Shotgun, and Then a Big Splash. The Boatman Recovers the Cake and the Iceman Drives On

ICE IS DELIVERED BY AIR AND WATER ROUTE

Ice is delivered in a rather spectacular way to a householder residing on the bank of Rock River at Cleveland. His house is within the shadow of a high bridge, and to reach it from the street level one must follow a long roundabout path on foot. For this reason the delivery of ice would be an exceedingly laborious and inconvenient undertaking, were it not that a simple, quick way of doing it has been found. When the ice wagon reaches the bridge its driver announces its arrival by yelling huskily to those in the house below. A man puts out in a boat to deep water, calls the number of pounds he desires, and then gives a signal for its delivery. The ice is dropped from the bridge to the water, a distance of 120 ft., and recovered by the boatman. A report, almost as loud as that of a shotgun, and a big splash are about all there is to it. Occasionally one of the cakes is broken in two by the heavy impact with the water, but at other times the loss is practically negligible.

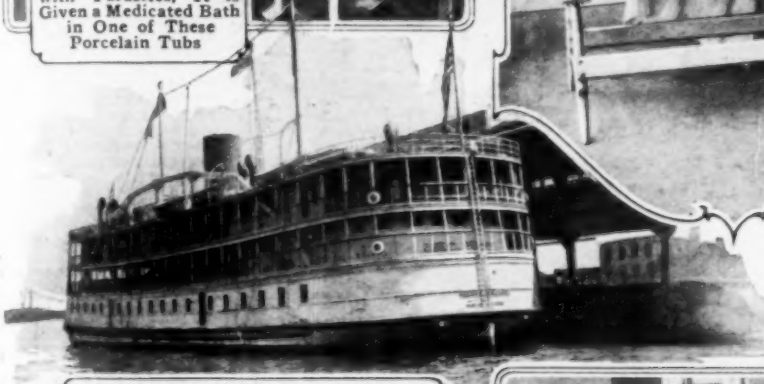
¶For the purpose of keeping fire-engine hose in good condition while idle a pneumatic drum, with valves, has been devised on which the hose is wound and with which it is so connected as to remain inflated.

SICK BABIES ARE TREATED ON HOSPITAL BOAT

At New York a philanthropic institution operates a hospital ship which during the hot months carries thousands of babies and their mothers away from the city's poverty-ridden, stifling districts onto the cooling waters of the bay. The boat is the "Helen C. Juilliard," a 215-ft. vessel with accommodations for 2,400 individuals. Physicians and trained nurses are in attendance to receive the little tots and permit none with contagious disease to get aboard. When a child is admitted it is examined and its ailment diagnosed. It is then assigned to some specific section of the ship. Those coming from the very poor homes where filthy conditions prevail, are immediately taken aft on the upper deck and given medicated baths. Small porcelain tubs are provided for this purpose and babies suffering with skin diseases, eruptions, or parasites, are cared for similarly. Forward on the

When a Baby is Suffering from Some Skin Disorder or is Infested with Parasites, It is Given a Medicated Bath in One of These Porcelain Tubs

On One Deck, Benches of This Sort, with Small Hammocks Attached, are Provided for Mothers and Babies, if the Latter Are Not Too Sick to Sit Up



The "Helen C. Juilliard," Hospital Ship for the Sick Babies in the Poor Sections of Crowded New York. In the Course of a Summer Thousands of Children are Cared For Entirely without Charge

When a Baby Is Too Sick to Remain in One of the Hammocks, It is Cared For in One of These Little Cribs, Provided in the Hospital Wards, and Given Medical Attention

same deck are four wards for children, operating and irrigation rooms, a sterilizing plant, and a ward for mothers. On the next deck below are arranged substantial benches with frames attached, from which small hammocks are swung. Babies not weak enough to require a bed in one of the wards are assigned to this deck. The mothers have access to shower baths and are given instruction in caring for their children's bodies, and in dietary and sanitation subjects. Meals are served on the lower deck, while warm sterilized milk is dispensed at several places. Everything is free, even the meals and milk.

Tickets giving access to the ship are distributed through the health department, various hospitals, and other institutions. When a mother has a sick baby and several other children who are well but not old enough to be left alone, a single ticket admits the whole family. During July and August daily trips were made and regular stops arranged at piers on the city's east and west sides for the accommodation of passengers. In winter sick and convalescent babies, mothers, and children are also cared for by those in attendance.

CAPTURE AND CONSOLIDATION OF GERMAN

HEREWITH is a remarkable series of photographs showing at close range the actual capture of a German trench and its consolidation by East Indian troops fighting with the allies "somewhere in France." The successive steps in the maneuver are pictured from top to bottom, beginning at the left. The first view shows the forms of those who fell in making the hand-grenade attack which routed the enemy. Below, the main body of the first-line men has reached the position and is charging past it, following the Germans. In the third scene the second line is advancing to the trench from the underbrush and the work of changing the parapet to face the opposite direction is being commenced in the midst of rifle and artillery fire. The final photograph shows the consolidation well under way, the first-line troops still remaining ahead and holding the enemy while their comrades shift the sandbags. The dead and wounded have been moved back out of the way, but as yet have not been reached by the stretcher bearers.

PHOTOS COPYRIGHTED

FIRST-LINE TRENCH BY BRITISH FORCE

VARIOUS PHASES OF WAR FROM BRITISH SIDE

Tommies Watering Their Artillery Horses at a Canvas Trough Hastily Erected Back of the Lines After the British Drive had been Started against the Enemy

Soldiers Lined Up in Advanced Trench for Roll Call at Outset of Allied Offensive

PHOTO BY AM. PRESS ASSN.

Transporting a Veritable Forest of Tree Branches to British Artillery Positions to be Erected in the Field to Form Protective Screens for Massed Batteries of Heavy Guns Operating against the Germans

"Somewhere in France," along the Line of the British Drive, Showing the Lancashire Fusiliers being Addressed by Their Division Commander before Advancing to the First-Line Trenches to Enter the Terrific Fray

TOLD IN STRIKING PICTURES MADE AT FRONT

First Prisoners Taken by British at Outset of Great Drive Arriving at Southampton: In Addition to Their Wounds, Most of the Men Clearly Show the Disastrous Effects of Trench Life

The Allied Offensive has Brought Some of the Big British and French Howitzers into Action for the First Time: This Is England's Reply to the Krupp Engine

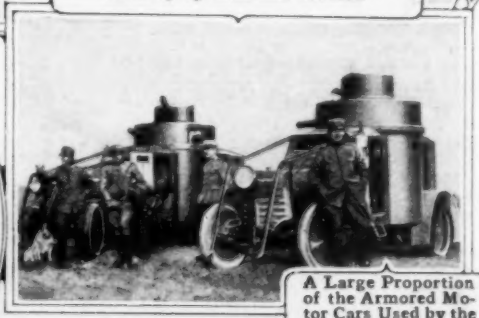
German Mine-Laying Submarine Captured by British and Berthed in Thames, Its Flag Surmounted by Enemy's Colors

Even the Craters Formed by Small Artillery Shells Have Their Uses: This Shows a Group of British Tommies Snatching a Siesta in Some of the German-Inflicted Scars behind Their Lines

ON SNOW-LADEN ALPINE BATTLE FIELDS

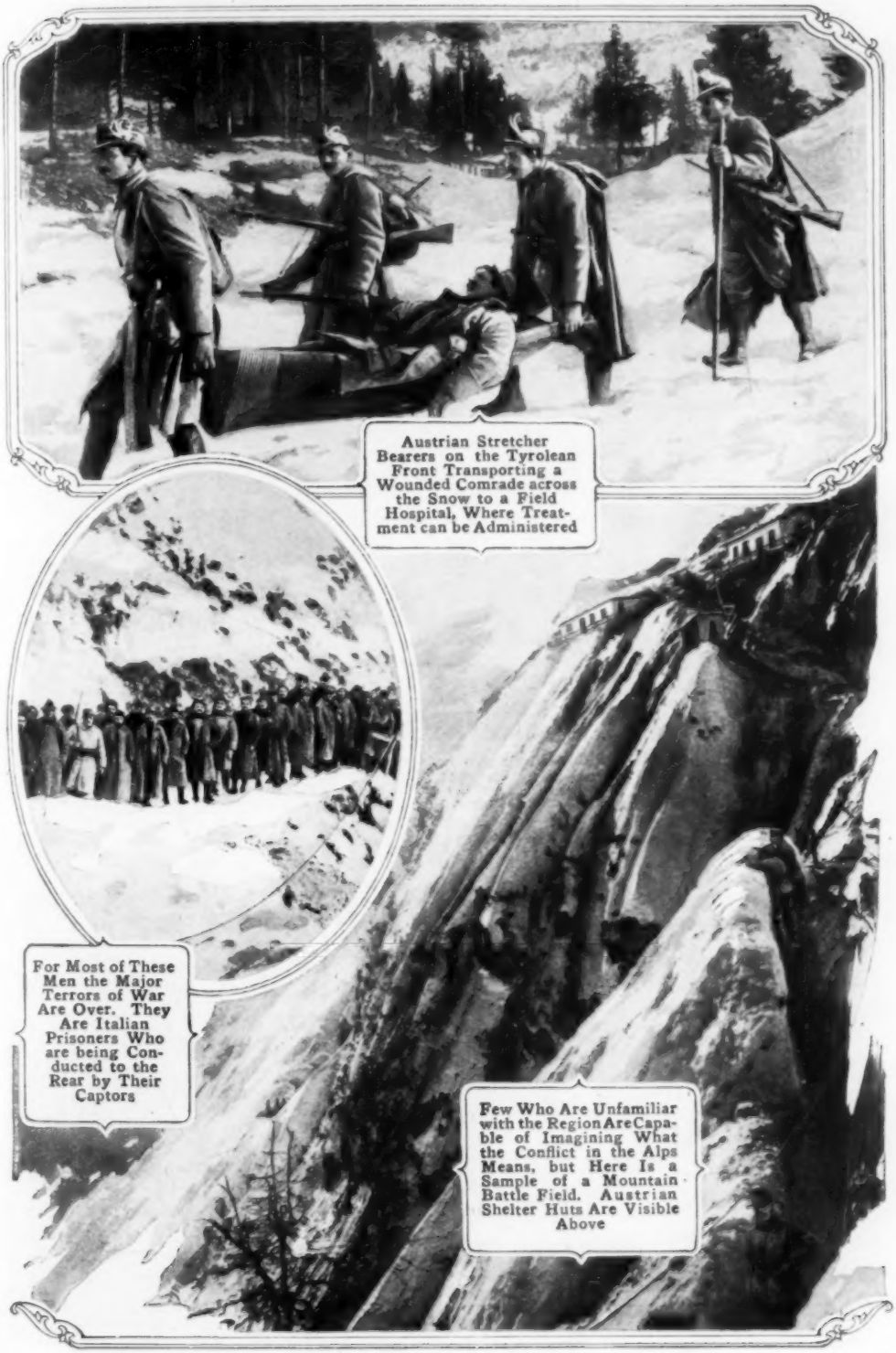
Transporting Ammunition on Sleds to Mountain Position. In Many Localities It Is Impossible to Employ Horses, as Here, and the Work must be Done Entirely by Men and Women

Austrian Radio Station on Rocky Summit in Alps. The Current Used by the Apparatus is Developed by a Portable Generating Unit Carried by the Signal Corps



A Large Proportion of the Armored Motor Cars Used by the Italian Forces Are of the Dual-Turret Type Shown Here, and Mount Three Machine Guns

This Photograph, Showing Austrian Fighters on Duty in the Alps, was Taken at the Time the Snow was Beginning to Melt and Cause Heavy Slides, Which Seriously Impeded Progress on Both Sides



Austrian Stretcher Bearers on the Tyrolean Front Transporting a Wounded Comrade across the Snow to a Field Hospital, Where Treatment can be Administered

For Most of These Men the Major Terrors of War Are Over. They Are Italian Prisoners Who are being Conducted to the Rear by Their Captors

Few Who Are Unfamiliar with the Region Are Capable of Imagining What the Conflict in the Alps Means, but Here Is a Sample of a Mountain Battle Field. Austrian Shelter Huts Are Visible Above

FRENCH WAR PICTURES SNAPPED AT RANDOM

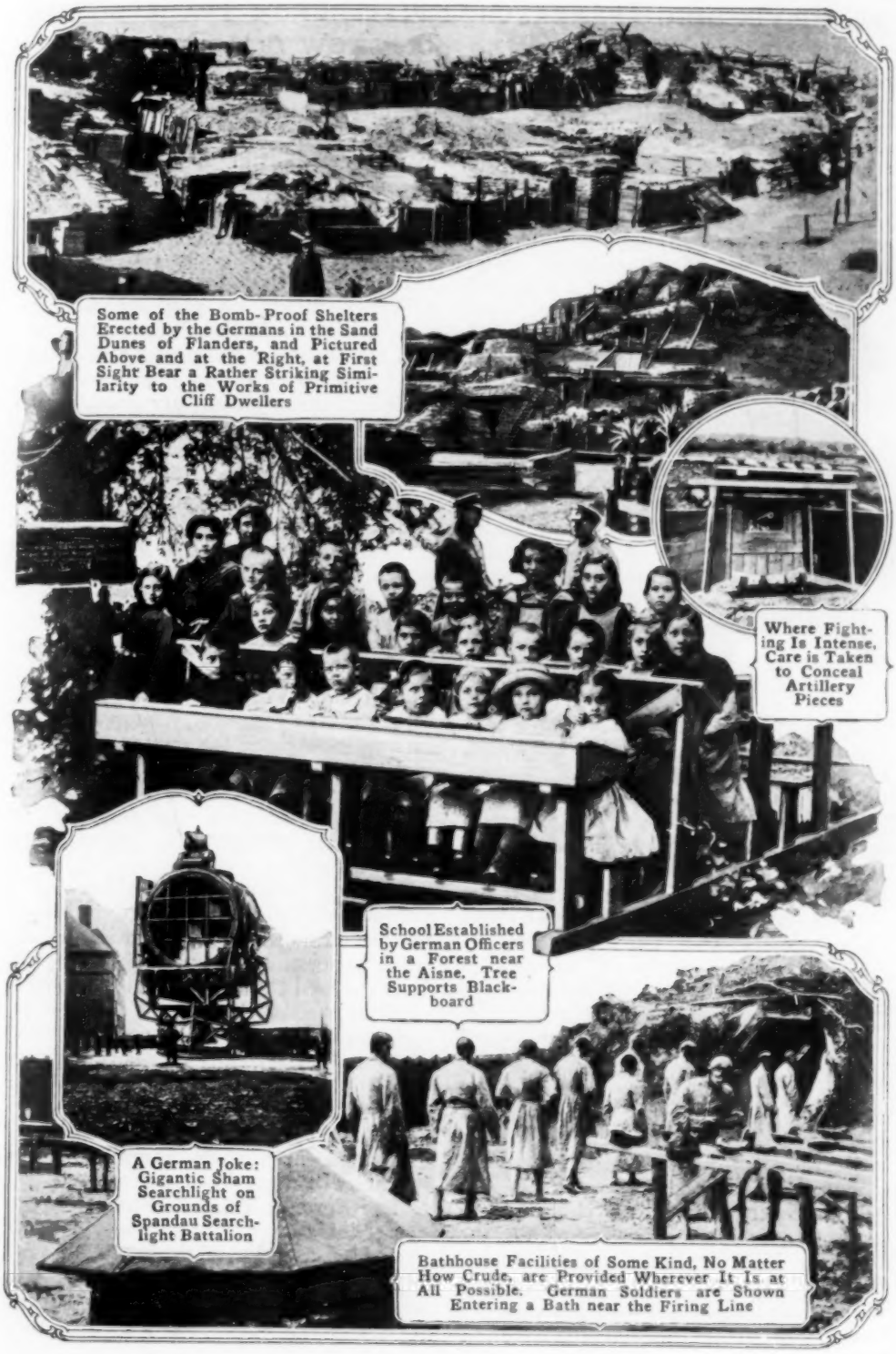
French Aviation Camp near Verdun Front as Seen from an Aeroplane: Hangars, a Score of Scout and Cruiser Planes, Many Motor Cars, and Tents of the Aerial Corps Are Plainly Visible

Nets are Strung over the Cots of French Soldiers at Saloniki to Protect Sleepers from Swarms of Mosquitoes

The Denouement of a Thrilling Aerial Encounter over the Battle Fields on the Western Front: The Wreck of a French Reconnaissance Machine Felled by a German Airman

Buildings along the River Front at Verdun have been Destroyed Completely in Many Instances and Badly Riddled in Others by German Shells during the Heavy Bombardment

GERMAN ACTIVITIES IN FLANDERS AND ELSEWHERE



Some of the Bomb-Proof Shelters Erected by the Germans in the Sand Dunes of Flanders, and Pictured Above and at the Right, at First Sight Bear a Rather Striking Similarity to the Works of Primitive Cliff Dwellers

Where Fighting Is Intense, Care is Taken to Conceal Artillery Pieces

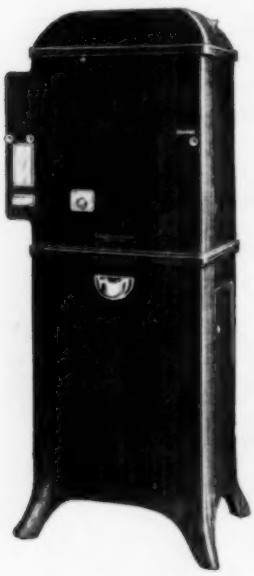
School Established by German Officers in a Forest near the Aisne. Tree Supports Blackboard

A German Joke: Gigantic Sham Searchlight on Grounds of Spandau Searchlight Battalion

Bathhouse Facilities of Some Kind, No Matter How Crude, are Provided Wherever It Is at All Possible. German Soldiers are Shown Entering a Bath near the Firing Line

STAMP-VENDING APPARATUS FLEXIBLE IN OPERATION

In hotels, clubs, and similar places the stamp-selling nuisance is eliminated and the service to guests improved by the installation of an ingenious vending machine that has lately been introduced at Chicago. This apparatus will accept a coin of any denomination from a nickel to a dollar and deliver the number of stamps desired—within the limits of the amount deposited—make the proper change, and collect a cent for the service. For instance, if a half dollar is inserted and five two-cent and three one-cent stamps are wanted, the machine returns 36 cents in change. It is provided with a highly sensitive coin scale which detects slugs, counterfeit pieces, and foreign coins instantly and returns them. At any time that the machine is unable to make change for a dollar, the coin slot locks automatically, while the same thing occurs when the supply of stamps becomes exhausted. The mechanism is operated electrically. All that a patron has to do is press a small plunger until the number of stamps he desires has been supplied. As long as this is depressed and the patron has credit remaining to his account, stamps will be delivered. Should one wish to break a dollar and purchase no stamp, 99 cents will be returned when the change lever is actuated. The stamps are held in the machine in rolls containing 2,000 and delivered in a connected strip. A machine installed in a Chicago hotel has totaled about 250 sales a day.



PITTSBURGH TRADE BODIES SHOW GOOD RESULTS

It is not only interesting but refreshing to study the accomplishments attained in city and business promotion by the Industrial Development and Foreign Trade commissions of Pittsburgh during their brief periods of activity.

The former body was established in 1911 and given a working capital of $136,474, raised by popular subscription, with which to advertise the city and attract more industries to it. The fund was to carry on the work for a period of three years. By good financing, however, the money has been made to last approximately five years. The body has taken direct action on propositions considered worth while and succeeded in drawing 36 industrial institutions, employing more than 8,000 persons, to the district.

In every way possible, the commission has made itself of service to local and outside concerns. As evidence of this, it has obtained more than $3,000,000 in capital and lines of credit for local enterprises. Fifty thousand dollars was obtained for one small manufacturer, for example, whose success was limited because of insufficient funds. The concern now employs 150 men as against the 15 for whom it formerly provided work.

A large industrial news bureau is maintained which supplies publicity matter and general information to 170 trade papers. National advertising has been derived through the use of motion pictures, and at the present time a comprehensive photographic review of the city's industrial activities is being prepared for educational purposes in public schools throughout the country. Also, what is claimed to be the first industrial map ever compiled by a municipality has been distributed.

The Foreign Trade Commission was created by an act of the city council in 1914 and endowed with $10,000 with which to carry on its work for a one-year period. This fund has been made to last 18 months and as a direct result

of part of the work accomplished through its expenditure, business in excess of $4,000,000 has been brought to Pittsburgh manufacturers.

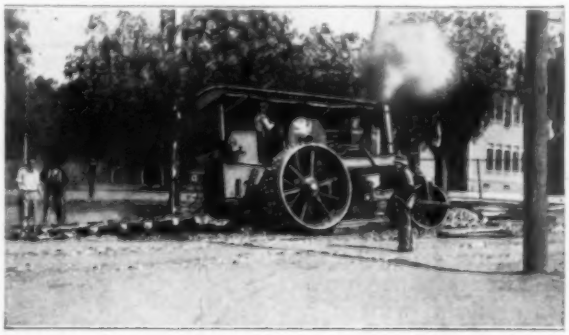
COTTAGES AS INDUCEMENTS FOR RURAL TEACHERS

Believing that more young people will enter the profession of rural-school teaching and remain in it after they are married if they are provided with comfortable homes by the school authorities, a campaign is being conducted in the state of Washington for the construction of cottages which shall belong to the school plants. Two sets of suitable plans have been drawn and already some cottages erected. The smaller of the two types is designed for two teachers or for a teacher with a small family. The combined living and dining room measures 13 by 19 ft. and is also suitable for small school gatherings, neighborhood and mothers' meetings, etc. Off of the bedroom is an alcove which may be converted into an open-air sleeping porch. A modernly plumbed kitchen and bathroom are provided. The cost of the building is $900, but without the bathroom and a cellar a saving of $300 may be effected. The larger cottage costs $2,300, which can be reduced $350 by omitting the bathroom and cellar. There are two large living rooms which can be thrown together for social occasions in connection with the school work or community activities.

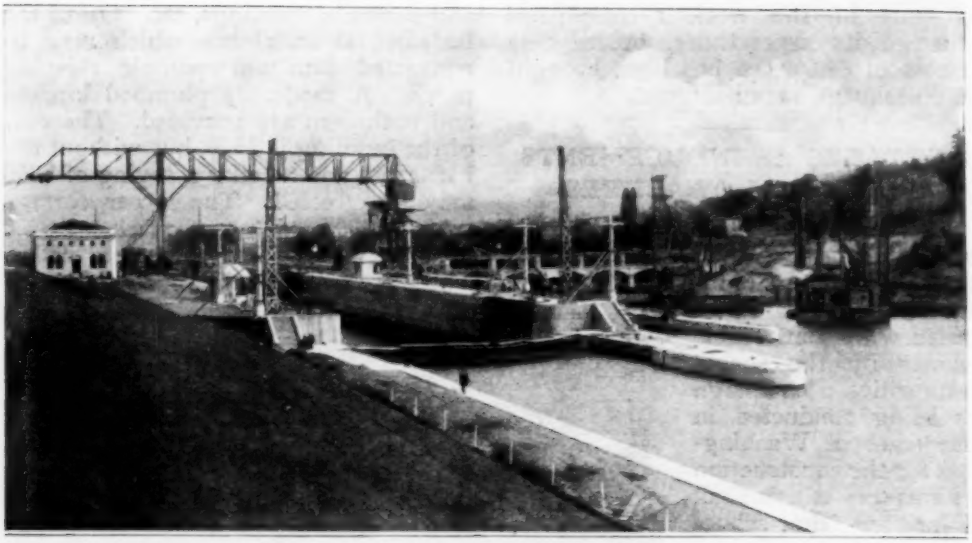
One of the Inexpensive Cottages Built in the State of Washington for Rural-School Teachers as an Inducement for Them to Remain in the Profession

TRACTOR USED TO PULL UP OLD RAILROAD TRACK

A steam tractor was employed recently to pull up a stretch of abandoned railroad track in a street, in Redlands, Calif., which was about to be paved. The city, having decided to improve this thoroughfare, which was once a railroad right of way, desired to remove the rails and ties in the quickest possible manner and at not too great expense. The plan of employing a tractor made it unnecessary to remove the rails from the ties, or to laboriously pry the structure loose by hand. Before the engine was hitched to the track, some of the dirt between the ties was removed, and the tractor was then able to pull out sections about 20 ft. long with considerable rapidity. In two days over a mile of track was torn up.



A Tractor in the City of Redlands, California, being Employed to Pull Up a Stretch of Abandoned Railroad Track. In Two Days More Than a Mile of Track was Torn Up by This Method



Locks Which Raise Vessels from the Level of Puget Sound to That of Lakes Union and Washington on the Canal Leading to Seattle's New Fresh-Water Harbor

SERVICEABLE RAIN CAPES FOR NEWSBOYS

Rain capes of special patented design, which are at once a means of protection in bad weather and an advertising medium, are now being worn by newsboys in various cities. The garment is made of a yellow waterproof fabric. It buttons snugly about the neck and hangs down almost to the knees. Slots in the sides permit the wearer to hand out his papers as they are wanted, while his bundle can be kept under the folds of the cape, well protected from the weather. In some instances the name of a newspaper or other advertising material is printed on the front and back of the capes. This garment is also suitable for drivers and others whose work requires them to be out of doors in all kinds of weather.

SEATTLE'S NEW HARBOR AND SOUND NOW JOINED

The canal which connects Puget Sound with Lakes Union and Washington and thereby creates a great fresh-water harbor for Seattle, has just been completed, having been under construction since 1911. The project, which was described in Popular Mechanics Magazine for July, 1914, involved the construction of two locks, one for large vessels and the other for small vessels, between Union Lake and the sound. In building these locks, which are perhaps the most striking feature of the new waterway, 220,000 cu. yd. of concrete were used. The state of Washington and King County contributed $1,000,000 to cover the cost of dredging the channel from the sound to the locks and beyond to Union Lake. The canal between Lakes Washington and Union lowered the former 9 ft. One of the expensive changes which had to be made was the raising of the docks at Ballard on Salmon Bay to correspond to the new water level. The Great Northern Railway rebuilt part of its line through the city and constructed a steel bascule bridge over the canal.

ELECTRIC POLE-SETTING DERRICK ON TRUCK

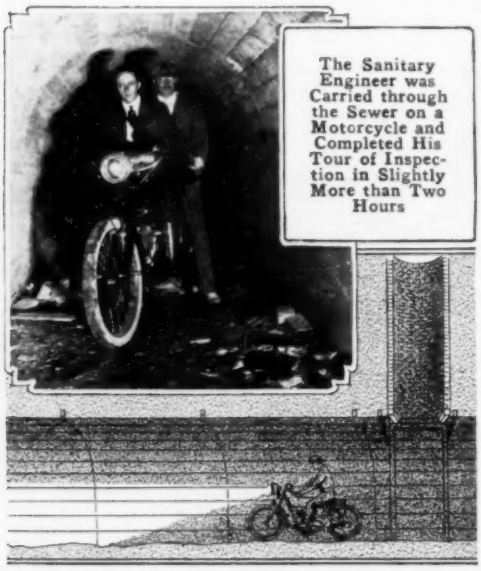
The labor of setting up telephone poles has been greatly lessened for a crew of Boston linemen by constructing a derrick which can be attached to or detached from their service truck in five minutes. The chief beam of the derrick is a 6 by 6-in. spruce upright, 17 ft. long, which is fastened to the rear of the truck. The lower end is notched and fits between the tailboard and the end of the body, the beam being also bolted to a heavy crosspiece fastened to the rear uprights of the truck's cover. Guy wires extending to the front upright help to steady it. The lifting is done with block and tackle and an electrically operated winch mounted on the truck. Recently four 40-ft. chestnut poles were picked up, carried 200 ft., and dropped into holes in 25 minutes with the aid of this derrick.

An Electrically Operated Derrick Which Reduces to a Minimum the Labor Involved in Setting Telephone Poles

ENGINEER USES MOTORCYCLE WHILE INSPECTING SEWER

When it recently devolved upon a sanitary engineer at Pasadena, Calif., to make a six and a half mile tour of inspection through a new sewer nearing completion at that city, he covered the distance by motorcycle instead of afoot. To have walked through the long tunnel and made the necessary examination of it would otherwise have consumed nearly a day's time. But with the aid of the machine the man was carried slowly along to the mouth of the underground bore and finished the work in two and a quarter hours. The cycle was lowered into the tunnel through a shaft. The engineer rode on the auxiliary seat at the rear and scrutinized the walls of the sewer as he was

driven along by a companion. Frequent stops were made for careful



The Sanitary Engineer was Carried through the Sewer on a Motorcycle and Completed His Tour of Inspection in Slightly More than Two Hours

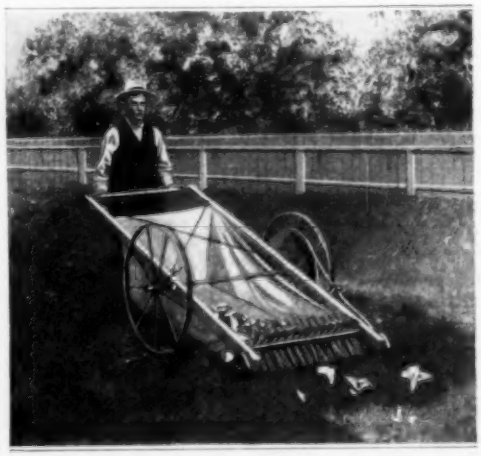
inspection of certain phases of the construction. No difficulty was experienced in making the trip.

ESTIMATING FLOW OF RIVER BY CHEMICAL PROCESS

According to a recent announcement before the Maine Society of Civil Engineers, a practicable way has been found for making use, when the water is badly polluted, of the electrochemical method of gauging the flow of a stream. Ordinarily a known quantity of chemical is placed in the water and after sufficient time has been allowed for its diffusion the amount of it present in a specific volume is ascertained. This provides a basis for fairly correct computations. Because of the large amount of impurities discharged into the waters of the Maine rivers by industrial plants, however, a muddy liquor is obtained by the evaporation of a sample. This interferes with the color reaction when nitrate of silver is added to neutralize the chlorine present, forestalling satisfactory results. To escape this difficulty the new method, consisting of making the quantitative analysis by measuring the resistance offered by the water to the passage of an electric current, has been devised. It is claimed that the plan can be employed even though a stream may contain quantities of the electrolyte used or other chemicals.

HOMEMADE LAWN SWEEPER OPERATES EFFICIENTLY

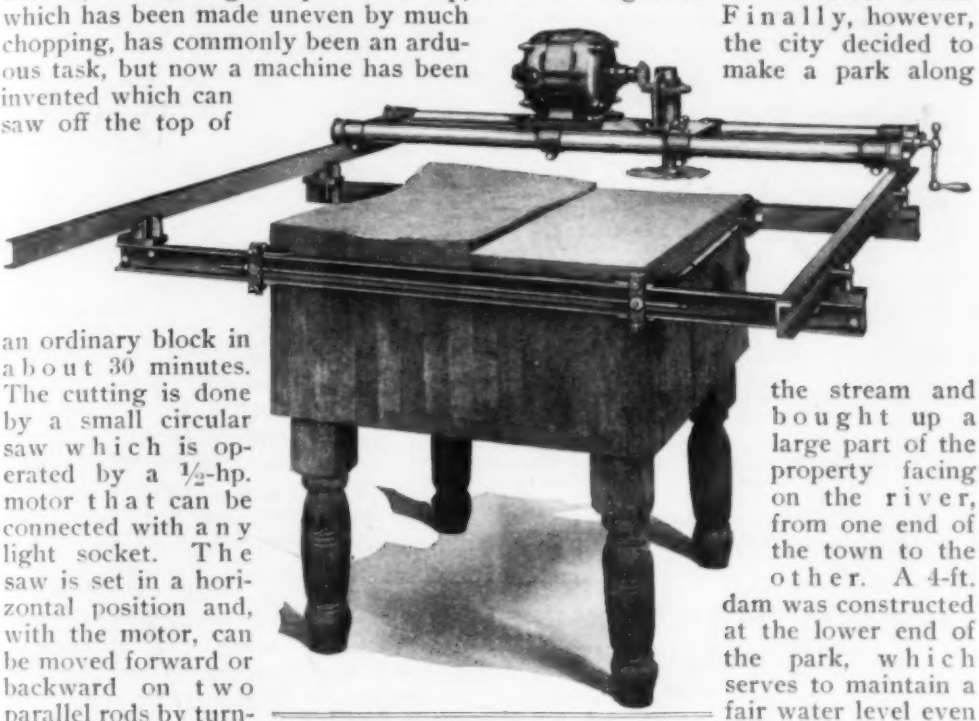
With a few odd pieces of material and a little ingenuity a man who has a mechanical turn of mind has constructed quite an efficient lawn sweeper. By pushing the contrivance as one would a mower, not only leaves and bits of paper, but cut grass and twigs as well, are picked up cleanly in one operation. The machine consists in part of a wooden framework carried on a pair of large wheels and mounting at the front end a brush of the revolving type fitted with stiff bristles. A large sprocket attached to one of the wheels is engaged by a bicycle chain which passes over a small gear fixed at one end of the rotary brush. The ratio between the sprockets is such that the brush is turned rapidly when the sweeper is pushed at an easy walking gait. All of the material picked up by the device is thrown into a large canvas receiver suspended from the frame after the fashion of a grass catcher on a mowing machine.



Dead Leaves, Paper, and Cut Grass are Picked Up by This Simple Homemade Machine

MACHINE FOR RESURFACING BUTCHER'S BLOCKS

The resurfacing of a butcher's block, that is, the sawing away of the top, which has been made uneven by much chopping, has commonly been an arduous task, but now a machine has been invented which can saw off the top of an ordinary block in about 30 minutes. The cutting is done by a small circular saw which is operated by a ½-hp. motor that can be connected with any light socket. The saw is set in a horizontal position and, with the motor, can be moved forward or backward on two parallel rods by turning a crank which operates a threaded shaft. These rods, the saw, motor, etc., can in turn be moved as a unit to the right or left on a track, one rail of which is set either side of the block. The entire supporting framework is held in position by clamps that fasten to the sides of the block. Assembled the machine weighs 180 lbs.; its heaviest part weighs 65 pounds.



An Electrically Operated Machine for Cutting Off the Uneven Tops of Butcher's Blocks Which can Accomplish in 30 Minutes What Heretofore has Been an Arduous Task

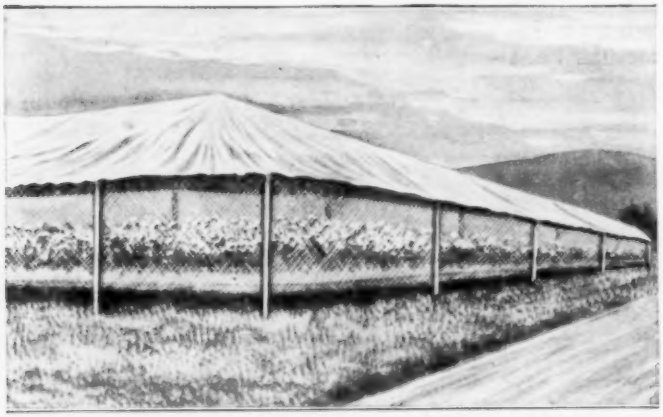
HOW A RIVER FRONTAGE WAS BEAUTIFIED

The problem of so improving a river front that it is pleasing to the eye whether the water is high or low has been solved by the city of Harrisburg, Pa. The Susquehanna River on which the city is located frequently is very low in summer, and formerly an unsightly strip of naked, unkempt bank and river bed was presented to view. In times of high water the land was often cut away and portions caved in, adding to the ugliness of the river front. Finally, however, the city decided to make a park along the stream and bought up a large part of the property facing on the river, from one end of the town to the other. A 4-ft. dam was constructed at the lower end of the park, which serves to maintain a fair water level even during dry months. Along the shore a promenade was laid out and a retaining wall was built having steps running its entire length. These lead down to the water's edge and make it convenient to draw a boat alongside the wall regardless of the height of the river. This walk and bank are brightly lighted at night. In summer the stream is used for bathing as well as boating, and in times of high water the retaining wall serves to prevent any erosion.

¶The success attending the addition of women to the forces in the munitions plants of Great Britain has resulted, according to recent reports, in the formation of a large concern in which women only will be employed. This plant proposes to continue active after the war is over.

CHRYSANTHEMUMS GROWN UNDER CHEESECLOTH

Many of the fine chrysanthemums which are produced in this country are grown neither under glass nor in the open, but under cheesecloth. In California a large number of Japanese are engaged in this work, a branch of floriculture in which they excel. The equipment of one Japanese chrysanthemum grower at Alameda, Calif., includes an area 100 ft. square covered with cheesecloth supported 8 ft. above the ground by a light wooden framework. Near the edges the roof of this cloth house slants; elsewhere it is level. In it delicate plants are set out about 10 in. apart, protected from the wind, sun, dust, insects, etc. As they grow they are carefully pruned so that each plant has but one stem on which there is a single flower. The cheesecloth lasts only a few months and has to be renewed every season.



Part of Japanese Florist's Establishment in California, Showing an Area 100 Feet Square Protected from the Wind, Dust, Sun, and Insects by Cheesecloth

CRICKETS PROTECT TRAIN CREWS FROM SHOCKS

Because the trainmen employed by an eastern interurban railway frequently received severe electrical shocks while using the company's roadside telephones in reporting the movements of their cars, that electric road has constructed crickets on which the men stand when telephoning. The telephones are sheltered by wooden boxes bolted to a pole near the track. It was found that especially in wet weather the trainmen would often receive shocks from stray currents while using these instruments. The crickets now employed consist simply of wooden platforms about 18 in. square mounted on large porcelain insulators. One of these will completely protect a person from any short-circuiting, while telephoning, even during an electrical storm.

Platforms Supported by Porcelain Insulators Which Protect Trainmen from Electric Shocks While Using Roadside Telephones

FIVE STATES ARE SHAKEN BY TERRIFIC BLASTS

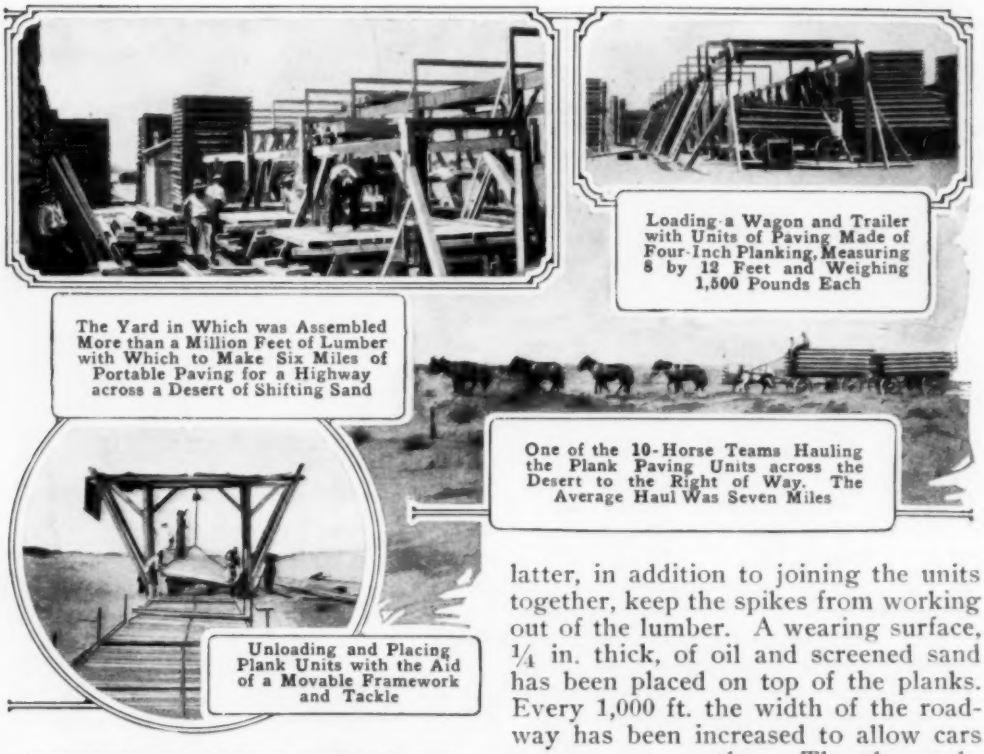
One of the most serious explosions that has occurred in years shook five states and damaged property to the extent of about $20,000,000, when fire of doubtful origin broke out on the

General Scene of Black Tom Disaster with Its Wrecked Piers and Shattered, Burned Warehouses. Dynamite, Shrapnel, and Shells Intended for Europe's Battle Fields Caused a Reign of Terror within the Shadow of the Statue of Liberty

Great Water-Filled Hole Where Formerly Stood Docks and Warehouses. In All About $20,000,000 Damage was Done to Property by the Munitions Explosion, Which Resulted in the Most Spectacular Fire Seen in the Vicinity of New York Harbor in Many Years. At the Right Are the Remains of Some of the Cars Which Escaped Total Destruction

Photos, Copyright Underwood & Underwood

munitions pier of the Lehigh Valley Railway at Jersey City late in July. One of the finest railway terminals in the country was demolished, the Statue of Liberty and many of the army buildings at Fort Wood were injured, and approximately $1,000,000 of plate glass in Manhattan, Brooklyn, and New Jersey buildings shattered. Thirteen warehouses, representing an investment of about $7,000,000, were destroyed in addition to the piers. Shrapnel and shells, awaiting shipment to Europe, burst with roars that threw thousands of persons into excitement. There were two heavy detonations that occurred within a half hour of each other. The fire started at the outer extremity of Black Tom Island, where there were many munition cars and several barges loaded with explosives at the piers. According to one version, a barge in tow of the tug "Geneva" exploded. This started the fire, which subsequently reached the cars on the piers and caused the second great blast.



The Yard in Which was Assembled More than a Million Feet of Lumber with Which to Make Six Miles of Portable Paving for a Highway across a Desert of Shifting Sand

Loading a Wagon and Trailer with Units of Paving Made of Four-Inch Planking, Measuring 8 by 12 Feet and Weighing 1,500 Pounds Each

One of the 10-Horse Teams Hauling the Plank Paving Units across the Desert to the Right of Way. The Average Haul Was Seven Miles

Unloading and Placing Plank Units with the Aid of a Movable Framework and Tackle

DESERT PLANK ROAD MADE OF PORTABLE SECTIONS

Confronted by the task of building a highway over a desert of constantly shifting sands, which in a few years might cover and render useless a roadbed of macadam or concrete, the California Highway Commission has introduced a type of paving which is portable, so that it can be easily moved to conform to the changing topography of the country. This paving is made of plank, built in sections 12 ft. long and 8 ft. wide, and was hauled by wagons to the points where they were needed. This unusual thoroughfare extends six miles across a portion of the desert lying between Yuma, Ariz., and Holtville, Calif. The plank sections are built on 4 by 6-in. stringers. The units were bound together by iron strips placed over rows of spikes, one either side and one along the center of the road. Round-headed bolts running through the planks and the stringers were used to hold the strips down. The latter, in addition to joining the units together, keep the spikes from working out of the lumber. A wearing surface, ¼ in. thick, of oil and screened sand has been placed on top of the planks. Every 1,000 ft. the width of the roadway has been increased to allow cars to pass one another. The thoroughfare cost $8,500 per mile. Over 250,000 running feet of 4 by 12-in. plank, 100,000 ft. of 4 by 6-in. stringers, and 100,000 ft. of iron strips were used. A crew of 80 men and as many teams labored four months to complete the task.

SPEEDS OF RATTLING CARS ARE OVERESTIMATED

From the results of experiments conducted by the psychological department of an Iowa university it appears that the average person is prone to overestimate the speed of a small, noisy motor car and underestimate that of a large, smooth-running one. About 100 students were recently assembled at a point past which machines of different sizes and conditions were driven at known speeds. As a vehicle passed, each person recorded on paper his personal estimate of its mileage per hour. Twenty-three trips were made with the cars, and from a study of the sub-

sequent tabulations it was found that when a driver continually sounded a horn in passing, the students considered the speed to be about five miles an hour greater than it really was. The discrepancy was double this when the rate of a rattling machine was considered. Of two cars traveling at equal pace, the smaller was invariably estimated to travel faster than the other. It is rather interesting, too, that young men and women who had never driven a car, made, on the whole, as nearly accurate estimates as did those of greater experience. Close guesses of actual speeds were made when cars jaunted along at 10 or 12 miles an hour, but when raced at 50 or 60 miles the guesses were extremely wild.

GAS-BURNING ATTACHMENT FOR AIR-TIGHT STOVE

Numerous appliances have been devised for converting coal and wood stoves into gas consumers, but few of them are more curious than one that has been developed and patented for air-tight heaters. This attachment is designed so that it may be inserted at the top of a stove and connected with a rubber tubing. It is easily attached and can be withdrawn at will to permit waste papers and other refuse to be destroyed. The burner is fitted at the bottom of a large flaring pipe which is curved so that it hangs inside of the drum. At the lower end of it there is also a disk deflector. The neck of the pipe passes through an adjustable collar at the top of the stove where it is provided with an air mixer and cock. The fumes are carried away by the regular stovepipe.

ATTRACTIVE PINK OUTFIT FOR STORMY WEATHER

The tendency of present fashions for women to give emphasis to complete sets of garments which match as to color, or material, or both, finds expression in a new storm outfit which consists of a rubber coat and hat and an umbrella all of one shade of pink. Even the flowers on the hat are of rubber. The coat is long and full and furnishes ample protection against rain and spray and is trimmed with large side pockets and a belt. The umbrella has a long straight handle, ribs set close together, and a frill around the edge, making it as attractive as a dainty parasol.

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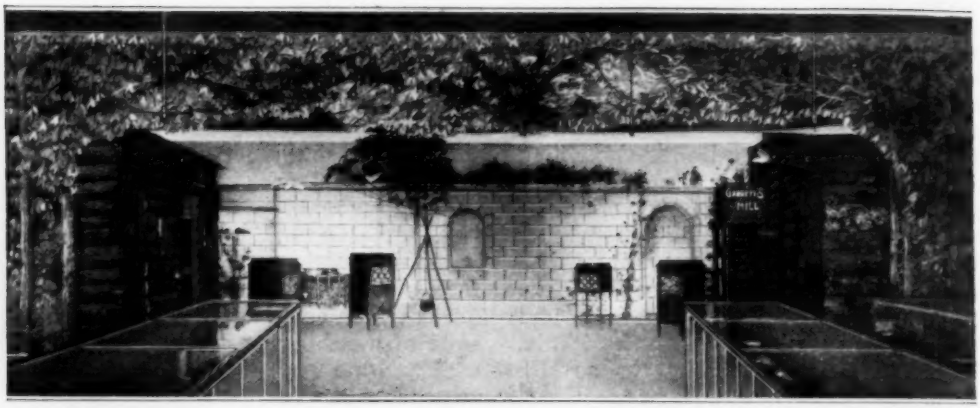
INSTRUMENTS DISPLAYED IN WOODLAND SCENE

A woodland scene has been reproduced with remarkable accuracy of detail by a dealer in Greenwood, Miss., as a setting for a display of musical instruments. The area devoted to this scene is 50 by 25 ft. At the left, as one enters, is a woodsman's cabin made of real logs from which the bark has not been removed. On the outer wall, beside the door, hang a banjo, a coon skin, and other animal skins. An old musket rests above the window and a dog horn hangs near by. In the central area, besides several phonographs, are a tripod supporting an iron kettle, a



Scene in Mississippi Store in Which a Woodsman's Cottage and a Mill with a Turning Water Wheel are Surrounded with Numerous Features Which Combine to Produce a Very Realistic Effect

manger filled with hay serves as a receptacle for phonograph records, a sawhorse, and other features suggestive of life in the forest. On the right is a mill made of logs and having a water wheel turned by water. The pool into which the water falls is made by molding plaster of Paris in the form of rocks in the bottom of a metal tank. Climbing morning-glories and ivy add to the scene. Placed at different points are stuffed squirrels, blackbirds, kingfishers, a hawk, doves, an English pheasant, and other creatures. By means of a special lighting system the glow of the sunrise or the silvery light of the moon can be reproduced to illuminate the scene.

NEW BRIDGE ACROSS LAKE QUINSIGAMOND BEGUN

Actual construction has been commenced on a thoroughly modern bridge across Lake Quinsigamond to connect Worcester and Shrewsbury, Mass. The present passage is supported on a gravel causeway, and for years has been entirely inadequate for the volume of traffic using it. It will be 895 ft. in length and offer space for a double-track car line with 14-ft. roadways and 8-ft. sidewalks on either side. The center arch of the new structure will have a span of 112 ft. The new bridge will cost $213,304 and will be completed in about two years.

HALF-TONE OVERLAYS MADE BY RAPID PROCESS

Overlays for half-tone cuts are being made at Chicago by a simplified patented process which saves time and expense. For the sake of explanation, an overlay is used to bring out strongly the low lights in a print made from an engraving. Usually it consists of carefully cut pieces of paper, or other material, that closely follow the outlines of heavy parts of a cut, pasted to a flat proof. When used in a press, it is placed between the impression surface and the stock to be printed, being alined to a hair's breadth so that the paper is squeezed into close contact with certain portions of the half-tone, and a sharper contrast between high and low lights thus obtained. Obviously, when these pieces are cut and pasted by hand, considerable patience and some skill are required. In using the new process, however, the difficult part of the work is obviated. A flat proof is struck and while still wet is sprinkled with a special powder which clings smoothly to the places where the ink is the heaviest. After the superfluous powder has been brushed off, the then raised portions are sprayed with varnish. The latter dries in about a half hour and completes the work. Overlays for an entire form of large half-tones can be made in this manner in a single operation.

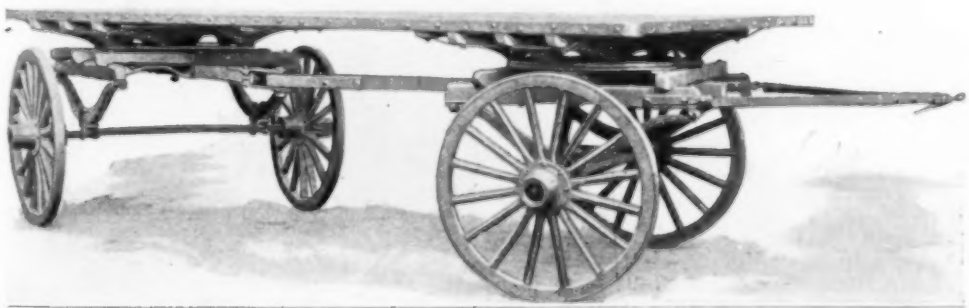
NEAT STEEL NEWS STANDS MADE IN SECTIONS

All-steel booths which are made in sections so that the structures can be enlarged or altered to suit changing needs have been installed in more than 80 stations of the Interborough Rapid Transit Company of New York. The new booths, which are used as news stands, supplant wooden structures which were much less attractive, and it is the attractiveness of the steel stands, together with their better display facilities, which are regarded as responsible for the marked increase in business that has come with the improvement. In one or two instances two clerks are now required instead of one. The exterior of the booths is finished in dark green, while the inner surfaces are enameled white. Magazines are displayed on shelves at the rear and suspended from rods above the counter. Beneath the counter is space for storing checked parcels. The interior of the booths is lighted by bulbs so set in the cornice that they are not visible from the front.

One of the Sectional Steel News Stands Recently Installed in the Stations of the Rapid Transit Company in New York

TRAILER THAT TURNS SHARP CORNERS

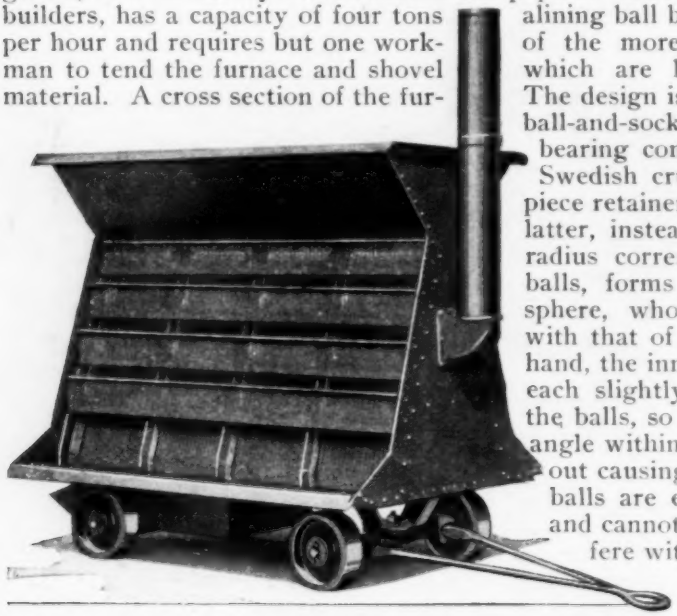
The difficulty attendant upon using a trailer in a narrow alley, or other confined quarters where short turns are necessary, has been overcome by the construction of a trailer, suitable for attachment to a truck or wagon, which follows directly in the track of the leader. Over the back axle as well as over the front a fifth wheel is mounted which permits the axles to oscillate freely. The reach connecting the front running gear with the rear is jointed in its center so that when the front wheels turn to one side the rear wheels turn in the opposite direction, thus making it possible to lead the trailer around a sharp corner.



A Trailer Especially Suited for Hauling in Lumberyards and the Like, Because on a Turn Its Front and Hind Wheels Follow Exactly in the Track of the Leader

NEW HEATER AND DRIER FOR GRAVEL AND STONE

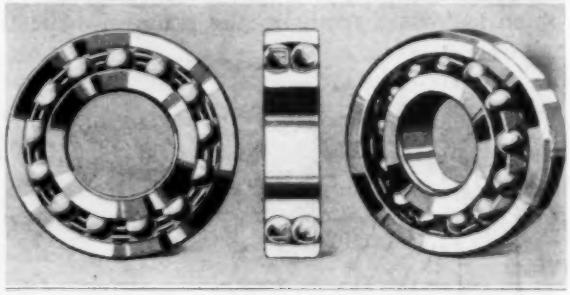
A heater for crushed stone and for gravel, now in use by contractors and builders, has a capacity of four tons per hour and requires but one workman to tend the furnace and shovel material. A cross section of the furnace, which extends the length of the device, is shaped like an inverted "V." Above it is the hopper which feeds the gravel or stone through 5-in. slits either side of the apex of the fire box. The gravel passes down over the sides of the furnace, which are perforated, and is partially held in check by perforated metal strips which extend along the sides longitudinally and serve as baffles, the lower and upper edges of each strip being set 3 and 5 in., respectively, from the sides of the furnace. The heated material accumulates at the bottom in space provided for the purpose, and as it is shoveled away more flows down from above. The heater is mounted on four low wheels. At one end are the furnace door and ash pan, and at the other is a smokestack. The heater is made of metal throughout.



A Portable Heater and Drier for Gravel Which will Heat Four Tons of Material an Hour. One Workman can Tend the Furnace and Shovel the Material

SELF-ALINING BALLS CUT FRICTION IN BEARINGS

It seems doubtful whether there is a popular understanding of how a self-alining ball bearing differs from some of the more commonly used types which are lacking in this feature. The design is founded on the internal ball-and-socket principle, while the bearing comprises a double row of Swedish crucible-steel balls, a one-piece retainer, and an outer race. The latter, instead of being ground to a radius corresponding to that of the balls, forms a section of a hollow sphere, whose center is coincident with that of the shaft. On the other hand, the inner race has two grooves, each slightly greater in radius than the balls, so that both revolve at any angle within the major member without causing undue strain. Thus the balls are entirely free at all times and cannot become bound nor interfere with the automatic compensation for the springing or deflection of a shaft. The pure rolling movement of the balls is aided by the equal distribution of weight placed over a large number of them. The load is automatically divided between the two rows, so that good working conditions are obtained. Any tendency that the balls might otherwise have to crowd or be forced together is prevented by the design of the races, which makes the tangents to the balls, at points of contact with the latter, parallel.



The Balls Revolve on the Spherical Outer Race with a Pure Rolling Movement Which Is Facilitated by the Equal Distribution of the Load between the Two Rows

EASING THE RAILROAD TRACKMAN'S BURDEN

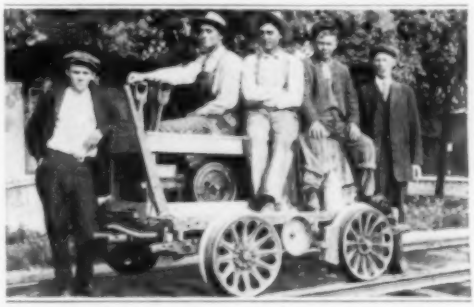
By J. E. MURPHY

COMPELLED to do his work by primitive hand methods that have changed but little since the beginning of railroading, the railroad trackman has long ranked as the poorest paid and most unfavorably situated of all laborers. In recent years a change has been taking place, a change that is fast placing the trackman in the position that his skill and experience and the importance of his work entitle him to—that of a skilled mechanic. As in many other lines of work this change is due to just one cause, the introduction of power-driven machines for doing the work formerly done by back-breaking hand labor. While such a transformation is necessarily slow, it is becoming more evident every day that the time is close at hand when machines will be universally used for doing all the heavy work connected with the construction and maintenance of railroad track—for the railroad managers are finding that it pays. They are finding that the work can be done better and more economically by the new methods than by the old, even when higher wages are paid, and that the new conditions attract and hold a better class of men than have heretofore been engaged in this work.

The first machine to break the evil spell, as it might be called, under which the trackman has labored, is the gasoline section car, which has been in use

Heavily Loaded "Push Car" Pulled as a Trailer by a Gasoline Motor Car

in a limited way for a number of years. What this means to the men engaged in the work is easily understood by anyone who has witnessed the laborious ordeal of pumping an old-time handcar. Starting the day's work by pumping such a car over from four to six miles of track, some of it upgrade, is enough to destroy the efficiency of



Railroad Handcar Equipped with Gasoline Motor: When These Men Reach Their Work They Are as Fresh and Fit as a Business Man Who has Gone to His Office in an Automobile

any group of men for the remainder of the day. On some of the most progressive railroads the section men now ride to their work on a gasoline car that is capable of making a speed of as much as 30 miles an hour. When they reach their work they are as fresh and fit as a business man who has ridden to his office in an automobile. Recognition by the railroad managers of the economic value of such modern equipment has been slow. Therefore, in dozens, if not hundreds, of cases the trackmen have taken the matter in their own hands and have pooled their funds for the equipment of their handcar with a motor, or for the purchase of a gasoline motor car capable of propelling the old-style "push car" at a high speed.

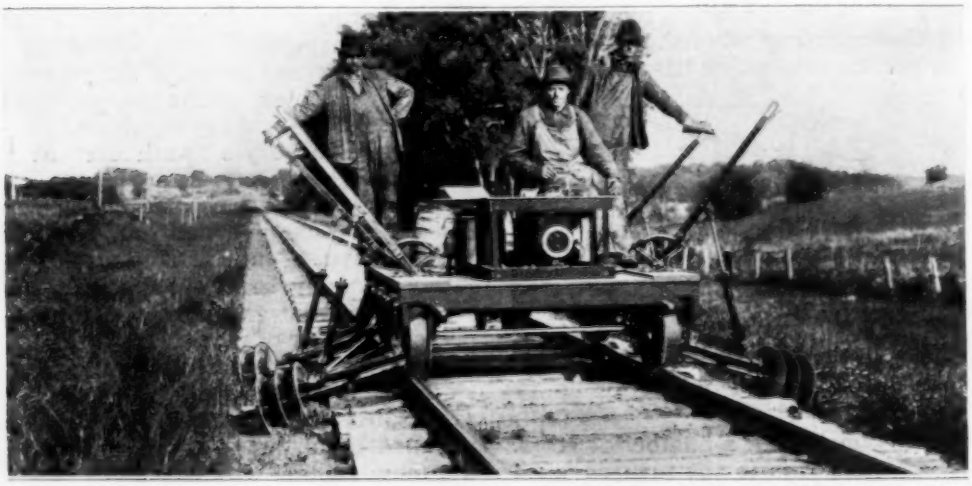
Two other machines that are rapidly coming into use and that are relieving the trackman of much heavy work formerly done by hand are the gasoline weeder and the gasoline mowing machine, the latter of which was described in a recent number of this magazine. Both of these machines are proving profitable for the companies that have installed them. It is stated that with the mower three men can do as much work in a day as 100 men working with scythes. Formerly it cost about $6 a

mile to mow a swath 6 ft. out from the weed line. With the machine the same work can be done for approximately one dollar.

The gasoline weeder is equipped with rotating disks that dig out the weeds in the ballast adjacent to the track, and work the ballast in toward the ends of the ties where it is needed. It is estimated that the cost of the machine work is only one-fifth that of handwork, while better results are obtained. Each of these machines is capable of taking care of an entire roadmaster's division.

This Mowing Machine, Which Requires Three Men for Its Operation, Is Capable of Doing as Much Work as 100 Men with Scythes

What is probably the most important innovation in track work is the pneumatic tamper, now being introduced. Not only does this machine relieve the trackman of one of his hardest jobs, but it is resulting in a big improvement in a feature of track work that is of vital importance on account of the enormously heavy rolling stock now in use—that of providing a firm and uniform bed for the ties. In crowded quarters, around complicated track work, it is often impossible to do efficient tamping with a shovel. With the machine all that is needed is about an inch and a half of space for inserting the tamping bar. The tamping machine is simply a self-propelled car equipped with a gasoline engine and an air compressor. For operation the car is set off the track by means of cross rollers, as shown in the illustration, and an air line is led from the compressor to each of the pneumatic tampers, which may be several hundred feet away. The tamper is equipped with a bar that delivers a rapid succession of blows in the same manner as a pneumatic riveter, and with it ballast of any kind is easily driven to a firm bearing under the ties. Here again the interests of the workmen and the railroad companies are identical. As the result of



This Machine Not Only Cuts Out the Weeds but Works the Ballast in toward the Ends of the Ties Where It is Needed. The Cost of Operation Is One-Fifth the Cost of Old Hand Methods

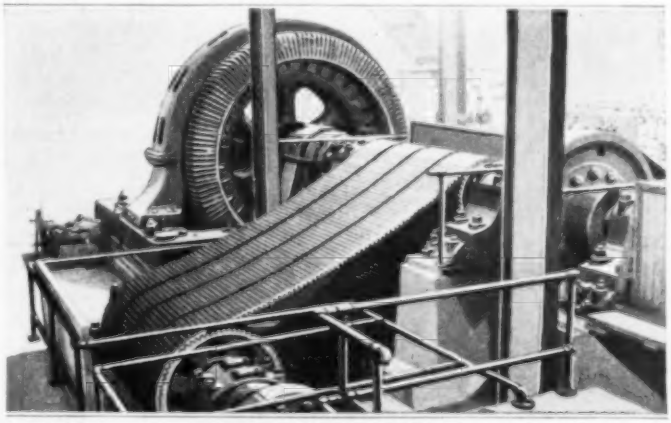
a number of tests carefully carried out and recorded, it is now known that machine tamping costs less than one-third as much as hand tamping, and that track tamped with the machine settles approximately one-half as much as track tamped by hand and subjected to the same service.

Each of the machines described above can easily be used for other work than that for which they are specifically designed, and they apparently represent only a beginning in the introduction of modern methods and equipment in railroad track work. The general adoption of such methods and equipment is sure to result in better and safer track, and in better pay, greater skill, and an increased self-respect for the men that do the work.

The Pneumatic Tamping Machine Set off the Track on Cross Rollers and Arranged for Work

ENORMOUS CHAIN DRIVE IN POWER PLANT

A chain drive of 5,000 hp., said to be the most powerful chain-drive gear in the world, is in operation in a hydroelectric plant on the Snake River in Oregon. Two water-wheel shafts, which make 149 revolutions per minute, are connected by four driving chains with a generator shaft that is driven 225 revolutions per minute. Each of the former shafts carries a 71-tooth sprocket wheel, 45½ in. in diameter, and the generator shaft has two 47-tooth sprockets, a little over 30 in. in diameter. The water wheels drive sets of four chains, each of which is over 31 ft. long, 21 in. wide, and weighs 2,800 lb. The chains have been tested to a strain of 40,000 lb. per square inch, though ordinarily the tensile strain is 600 lb. A chain drive was not contemplated for this plant originally, but in the midst of its construction and after part of the machinery had been delivered, financial difficulties interrupted the work. After some time experts recommended the chain drive as the most economical means of utilizing the available equipment.



A 5,000-Horsepower Chain Drive: Four of Eight Chains, 21 Inches Wide, Which Run from the Shafts of Two Water Wheels to the Generator Shaft of a Hydroelectric Plant

RESIDENCE BUILDING MOVED ACROSS BAY ON BARGES

While being occupied, the one-and-a-half-story dwelling of the keeper at the Georgetown, S. C., light station was recently moved a mile and a quarter across Winyah Bay from its original site on South Island to a new location on North Island. The structure was carried on two lighters towed by tugs, and so carefully handled that even its heavy brick chimneys were not disturbed. It is 51 by 56 ft. in outside dimensions and weighs about 115 tons. It was moved with the aid of hand screws onto a temporary trestle built out over the water. The barges were placed in the proper position beneath this structure at ebb tide, so that when the water rose to a higher level the building was lifted up by the craft, which was then taken in tow. After being piloted across the bay to North Island the house was transferred to a similar trestle in the same way that it had been removed from the first one. Subsequently it was moved 400 ft. or more inshore to the new site.

Above, the House is Shown on the Trestle from Which the Barges Lifted It as the Tide Rose. The Picture Below was Taken as the Trip across the Bay was being Made

HONOR PLAN FOR SPEEDERS ABANDONED BY COUNTY

Readers of Popular Mechanics Magazine will recall that some time ago Fresno County, Calif., placed all motorists upon their honor and advertised the fact that there were no "speed cops" patrolling its highways. There is a sequel to the story. The large billboards erected at the county lines and bearing the information that the honor system existed, are now for sale. Furthermore, Fresno County has speed laws, a traffic officer, and courts for dealing summarily with offenders. Many motorists respected the trust placed in them by the county authorities, but others upon reading the signs apparently interpreted them to mean that road races were in order and that their engines alone determined the speed limit. When a traffic officer was again resorted to, speeding motorists felt outraged upon being halted, and complained that the county was acting dishonorably by saying one thing and doing another. Therefore painters have blotted out the wording on the signs along the highways, and the honor system has passed, so far as Fresno County is concerned.

WINDOWS EVEN WITH FLOOR VENTILATE SCHOOLROOM

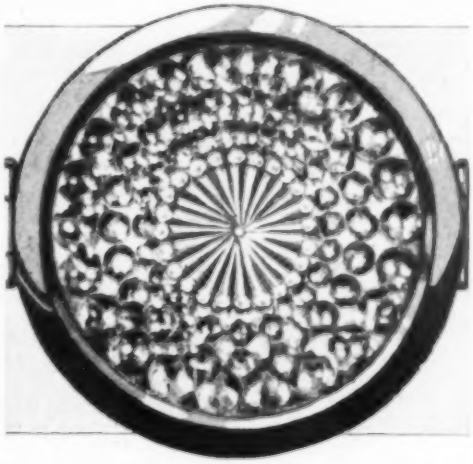
While studying the problem of schoolroom ventilation a California school superintendent found that ordinary windows are not properly placed to take off the heavier gases generated

California Schoolroom, the Outer Walls of Which are Practically Filled with Windows, Including Rows Even with the Floor, Designed Especially as Aids to Thorough Ventilation

by the breathing of several persons in a room, and that ventilators close to the floor are necessary. To meet this need he devised a type of schoolroom which has been widely adopted in Santa Clara County. The two outer walls are practically filled with windows, including rows even with the floor. These lower ones, like the others, are hinged at the upper edge and stand open practically all the time. It is stated that the pupils in these rooms show marked improvement in their work. Lighted candles, which consumed the same proportion of air that 36 children would, were placed in a small model of one of these rooms and were extinguished in less than two minutes, when the windows were closed.

MOTOR HEADLIGHTS WHICH REQUIRE NO DIMMING

A new type of glass front for automobile headlights which requires but one bulb per light and but one switch, is now being introduced in cities where the law specifies that no vehicle lights shall be glaring. These glass fronts are constructed with numerous small lenses molded on both surfaces in such a manner that they diffuse the light without obstructing it, the glass being transparent. Headlights equipped with these glasses, it is claimed, will amply light a country road both at a distance and close by. At the same time they do not possess that intense brightness which is so objectionable to approaching motorists or pedestrians, either in the city or the country.



Glass Front for an Automobile Headlight That Diffuses the Light in Such a Manner That Dimming Is Unnecessary

ARTISTIC AND UNUSUAL PIECES OF FURNITURE

Lounging Chair with an Extension That Is Slightly Curved to Fit the Body

Mahogany Wall Motto, with Appropriate Inscription, Suitable for a Gift

Book and Magazine Stand with Woven-Cane Ends

Narrow Table Intended to Stand behind a Davenport Set Out from the Wall and to Hold Magazines and a Lamp

Artistically Designed Phonograph with a Convenient File for Records

Odd Stool with Low Curved Back

Two Chairs and a Stool of Uniform Style Which can be Set Close Together to Form a Comfortable Couch

ILLUSTRATING PRESENT TRENDS IN DESIGNING

Chair of Massive Design Made Light by Use of Cane

A Pleasing Combination of Rich Wood and Upholstery with Cane

Combination Tray and Table: Legs Fold Up When Concealed Springs are Pressed, and are Unfolded in a Similar Way, without Releasing Grasp on Handles

Dainty Screen with Upper Panels Hand-Painted or Embroidered, and Protected by Lattice-Work

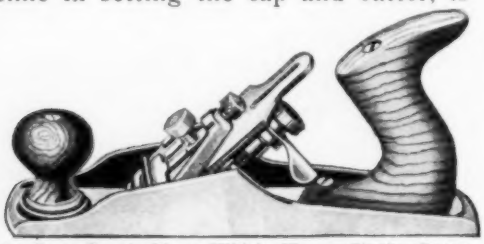
Artistic Slanting Foot Rest for Use with Reclining Chair

Octagonal Breakfast Table of Exquisite Design with Reed Shelf Underneath

Library Table Which Matches Chairs at Top of Page: Magazine Shelf Strengthens the Legs but, Being of Cane, Adds Little to the Weight

TIME-SAVING FEATURE MARKS NEW PLANE

A new style of carpenter's plane, which is designed to save the user's time in setting the cap and cutter, is



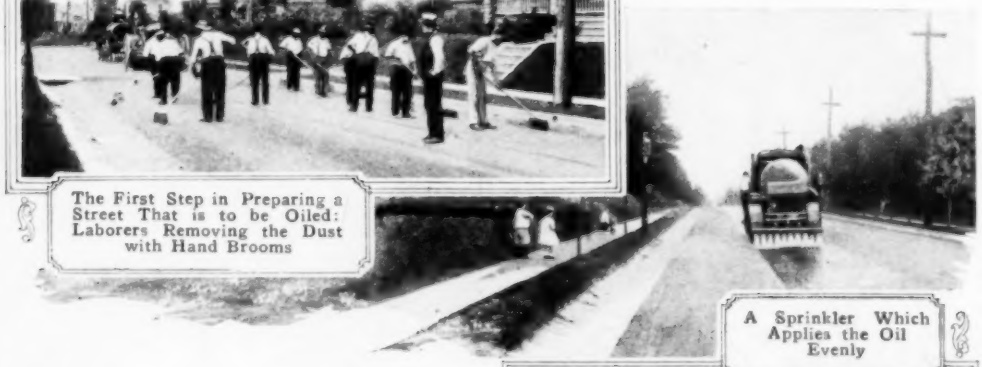
An Iron Bench Plane Which Has a Single Cutter Instead of a Double or Spring-Cap Cutter, and Other Special Features

made with a single cutter instead of the double or spring-cap cutter commonly used in iron planes. Its most important feature is in the construction of the clamp, which combines the cap and clamp found on the spring-cap type of plane. The user can make his adjustments of the clamp by means of a regulating screw, and it will not be necessary to change it until finer or coarser work is desired. When, for example, the clamp is removed for the purpose of grinding or honing the cutter, it will always drop back into its original position without further adjustment. Other features of this tool are the lightness of construction and a frog which is not adjustable, but is held firmly in the bed of the plane by two machine screws. The larger planes of this type have large knobs at the front which are adjustable, to permit the user to change his grip if desired.

OILED HIGHWAYS PROMOTE COMFORT AND ECONOMY

The sprinkling of roads and streets with crude oil is solving the dust problem in many parts of the country where the heavy automobile traffic formerly filled the air with stifling dust. Particularly in centers of population just outside the area of paved streets has oiling of the highways become imperative. Laying the dust with water is now being generally abandoned because it is more expensive than oiling and tends to wear out the road's surface rather than build it up, as oil does. In districts about Philadelphia, for example, the bituminous surface treatment, as it is sometimes called, has been successfully applied

The First Step in Preparing a Street That is to be Oiled: Laborers Removing the Dust with Hand Brooms



A Sprinkler Which Applies the Oil Evenly

The Final Treatment: Scattering a Thin Coat of Sand over the Oil Dressing

about once a year. A macadam street is first sprinkled with water and then swept with a horse-drawn broom and hand brooms. The bituminous material, of which there are several kinds, is then applied in a thin coat with a pressure distributor, in some cases hot and in others cold. After about 12 hours, fine gravel is sprinkled over it, 13 to 18 lb. being used to the square yard. Dirt roads and poor macadam roads which are not worth the more careful treatment are often oiled about twice a year, without being swept or sprinkled with sand.

INVENTOR WOULD FILL MINE WITH ICE TO SAVE CITY

To prevent Scranton, Pa., from caving into the abandoned subterranean caverns cut beneath it by coal miners, a local inventor has worked out a strange scheme which he believes would solve the city's problem if employed. The feeling of danger has been increased by the removal of the pillars which in the past supported the surface and prevented it from crumbling. The man's plan consists of filling the mines with ice, the slow glacierlike movement of which he considers would cause it to be packed solidly so as to form a substantial foundation for the town. Although at the outset much of the ice would melt, the inventor contends that the melting would cease as quickly as the surrounding ground became thoroughly chilled. Furthermore the packing would be done during the wintertime. The presence the world over of underground ice deposits is cited to strengthen the contention that the scheme, which he expects to patent, is feasible. As yet, however, it has not been publicly stated what method would be employed to provide the enormous quantity of ice which would be needed. It is indicated merely that some artificial process would be used and that the cost would be less, by nearly half, than that of any other permanent scheme so far suggested for accomplishing the same purpose.

SWARM OF BEES KEPT IN A CITY OFFICE

Of the many curious places in which bees have been kept, few are more novel than that in which an official in Muncie, Ind., who is a great bee fancier, houses

Bee Fancier in His Third-Story Office in Muncie, Indiana, and the Hive in Which He Keeps a Swarm of Bees

a swarm of his honey gatherers. For more than a year the bees have lived in a hive in his third-story office, close by a window and a radiator. The latter has kept the bees warm in winter. In the side of the window frame a slot has been cut, and as soon as the weather permits, the bees can be seen starting on their search for honey. As an incentive to begin their hunt their owner placed a row of chocolate creams on the outside window sill. These were soon discovered and set the bees to humming; a little later they began their flights up and down the business streets and to regions far beyond. The bees visit the flowers which decorate the office windows and flower shops, and even discarded candy does not escape them. Last year the honey yield was about 50 pounds. This year the owner hopes for 75 or 100 pounds.

SAN FRANCISCO ADOPTS NEW ORNAMENTAL LIGHTS

Both sides of a very busy section of San Francisco's chief business street are to be adorned with new ornamental lights, supported on standards 30 ft. high. These metal posts have been designed by the chief of illumination of the Panama-Pacific Exposition and are tastefully embellished at the top and base. Each post supports three lamps, one in the center and two somewhat lower on arms that project at right angles from the upright; the three have a combined lighting capacity of 4,500 cp. The average distance between the posts will be 110 ft., so that the whole street will be flooded with light. The upper lamps will be on a separate circuit and will be turned on all night; the annual cost, which is estimated at $12,750, will be borne by the city; the lower lights on each standard will burn until midnight and their cost per year, which will be approximately $20,000, will be borne jointly by the merchants, property owners, and the street-car company. The lamps will extend up Market Street from the Ferry building, 13 blocks on one side of the street and 15 blocks on the other. Merchants expect to benefit by the improvement.

¶Before Verdun the French are drawing their supply and ammunition trains with "twin engines." Should the first locomotive be destroyed by shell fire, the second would be brought into service and traffic kept moving.

EXPOSURE CARD IS RECORD FOR AMATEUR CAMERA MAN

For the convenience of amateur photographers, a fairly dependable exposure meter has been introduced which departs widely from those in ordinary use. It offers a beginner a certain advantage in that it enables him without trouble to prepare a permanent record of the conditions under which a specific negative is being exposed. This, when preserved, permits subsequent reference and intelligent study of the results attained. The meter consists of a plotted chart of post-card size bearing a series of curved and slanting lines. Each of these relates to some condition such as latitude, month, hour, sky, and subject. To determine the proper length of exposure to be allowed, the user draws a pencil from one point to another, on the various lines, descriptive of the conditions encountered. When he completes the diagram his pencil ends at a figure indicative of the amount of time to be given. A number of these charts are bound together in a thin book that fits into one's pockets.

TINY HOUSE USED AS MAIL BOX AND STREET LAMP

Standing in front of a home near Chicago is a mail box which in design resembles a dwelling. It is supported by a large square post, on the top of which is a platform that extends several inches beyond the pillar, forming, as it were, a yard for the house, which is surrounded by a miniature fence. The mail is removed from within the structure by opening the large front door. At night it is lighted from the inside by an electric light, giving it a very realistic appearance and making it serve as a street lamp as well as a mail box.

DUAL ENGINEERING FEAT UNDER NEW YORK HARBOR

The blasting off of a 15-ft. layer of rock from the top of Coenties Reef in East River, New York, just east of the lower end of Manhattan, and, at the same time, the boring of two tunnels under this reef, constitute a dual engineering undertaking now in progress that is calling for unusual precautions and skillful procedure. The tunnels will serve as a new rapid-transit link between Manhattan and Brooklyn. The cost of cutting down the reef is being borne by the Federal government and New York City. At mean low tide the reef has been 25 ft. below the surface, a distance that is not regarded as safe for some heavily laden boats. Indeed, on certain occasions, the ledge has proven a barrier to the nation's battleships in their path from the navy yard to the sea, when the tide has been abnormally low. The new depth of 40 ft. will be more than sufficient, it is believed. The tunneling, which could not well be delayed until after the channel was deepened, is progressing ahead of and faster than the river-bottom excavating, which is proceeding at right angles to the tunnels. In this way the two blasting operations have been well separated, and the channel workers have had steel-lined tunnels below them so that there is little danger in case their blasting makes slight rifts in the rock. However, as a precaution against wrecking the tubes, the channel blasting has been conducted cautiously, the rock being carefully honeycombed with holes and the size of the charges and the depth at which they are placed being less than they otherwise would have been. As the rock is crumbled it is removed by dredges.

Sectional View of Coenties Reef, Showing the Manner in Which Blasting and Excavating are being Done above the Tunnels

General View, Showing Relative Location of Tunnel being Cut under East River, Connecting Lower Manhattan, on the Left, with Brooklyn, on the Right

COMMUNITY SHAFT MARKS APEX OF DIXIE HIGHWAY

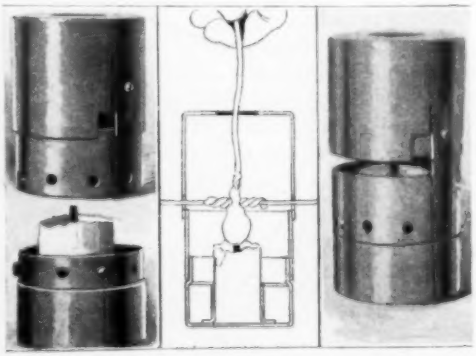
A monument, which represents in an unusual way the community in which it was erected, was dedicated recently

Shaft Marking Apex of Dixie Highway at Straits of Mackinaw: Every Inhabitant within a Radius of 10 Miles is Represented by a Stone

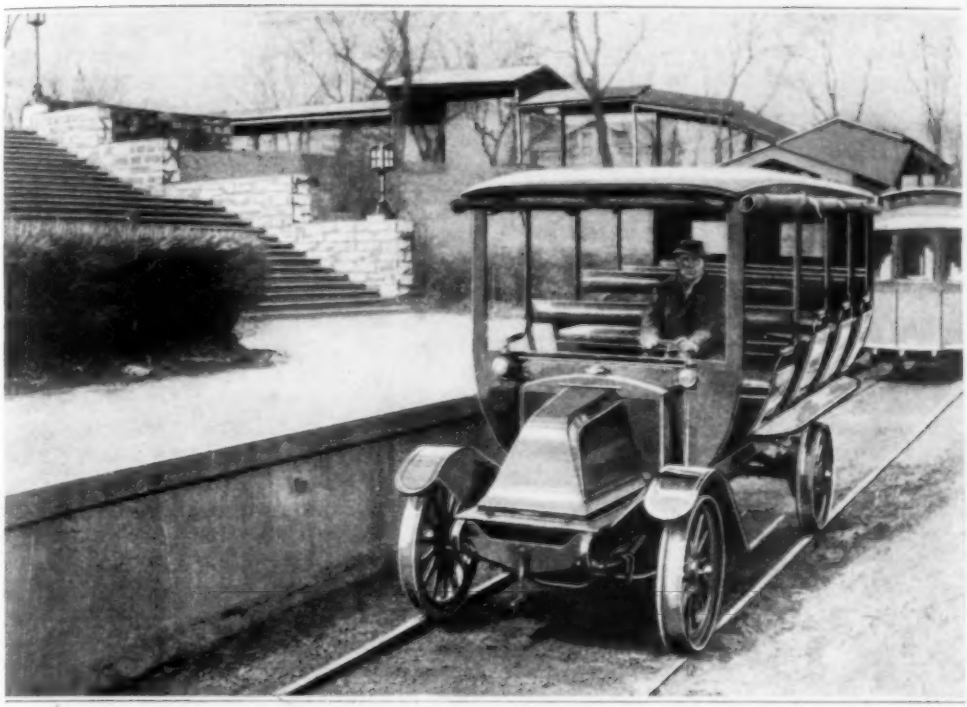
in Mackinaw City, Mich., on the Straits of Mackinaw, to mark the apex of the Dixie Highway. It is composed of small stones, each of which was brought to the spot by a local farmer or villager. Every man, woman, and child within a radius of 10 miles is represented in the landmark, which stands 15 ft. high and is in the form of a slender truncated pyramid, surmounted by a sphere and by suitable road signs. The stones are set in cement, those forming the surface being only partly imbedded. In addition to marking the apex of the Dixie Highway, the monument also stands at the terminal of the West Michigan and the East Michigan pikes. It was designed and constructed by a farmer.

SOLDERING LAMP HEATS WITH A CANDLE

Simplicity and efficiency have been combined in a soldering lamp for linemen, electricians, etc., which has been patented recently. The article is made of brass in three parts, a cup or standard, a cylinder, and a cap, which fit one to the other and are fastened together by means of studs inserted through slots. The cup holds a candle and has holes in its sides through which the air enters the lamp, the latter being slightly larger in diameter than a candle. The cylinder fits over the cup and is perforated with holes corresponding to those in the base, so that by turning it the draft can be regulated according to the strength of the wind. Fitted to the upper end of the cylinder is the cap, and by withdrawing the latter as far as the studs permit the lamp can be hung onto a wire, after which the cap is pressed down, the wire passing over the flame and through notches in the sides of the cap. Solder is applied through a hole in the top. By removing the two upper members the candle, supported by the standard, can be used for lighting.



A Simple Soldering Lamp for Linemen, Which can be Hung to a Wire: It Heats by Means of a Candle and will Remain Lighted Even in the Face of a Strong Wind



This Motor-Truck-Tramway has Solved the Transportation Problem for One of the Wealthy Country Clubs near Chicago

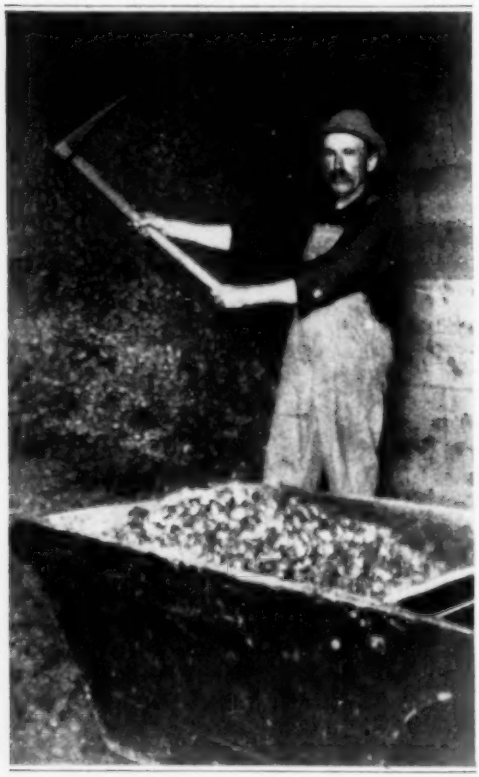
MOTOR CAR RUNS ON RAILS AT LOW COST TO CLUB

By inaugurating a motor-car tramway service over the track of its privately owned electric line, a country club near Chicago has evolved a way of economically transporting its members to and from a suburban railway station some distance away. It is 2½ miles from the club grounds to the depot, and the cost of the current consumed in making the round trip with a small street car has been about $3.50. At week ends, when capacity loads are hauled, the car is able to more than pay for its operation. During the remainder of the time, however, when there is only a half dozen or more passengers, it cannot be run except at a considerable deficit. Because of this a standard motor truck has been purchased, fitted with cross seats, flanged wheels, and a straight front axle, and put in operation on the line. Actual usage has shown that this car, with a load, can make the round trip of 4½ miles at an expense of less than 10 cents for fuel and oil. Thus it can meet all the trains and carry small groups of passengers at a profit. On Saturdays and Sundays, when the traffic is heavy, both the street car and truck are used. To enable the latter to be reversed at opposite ends of the line, turntables have been installed.

COAL-MINING METHODS USED IN HANDLING FRUIT

Several men employed by a farmers' fruit-packing organization in California are called prune miners because it is their task to pick and shovel their way into tons of prunes which are stored in the association's warehouse. To this packing house all the farmers bring their prune crop to be weighed and graded, after which it is stored in bins according to size. These bins hold about 40 tons, and by the time ship-

ments are made the prunes are packed into a solid mass, and can only be dug out with picks. Before being packed



A "Miner" Digging His Way into a Mass of Prunes Weighing Many Tons

in the shipping boxes, they are run through boiling water for three minutes.

GAS EXPLOSION KILLS MANY IN LAKE ERIE TUNNEL

About a score of men lost their lives as a result of an explosion in a waterworks tunnel, under construction beneath Lake Erie at Cleveland, the latter part of July. Half of the victims were men who heroically fought to rescue their comrades imprisoned behind tons of debris and earth in a gas-filled hole, 128 ft. below the surface of the water. A large number of others were partly asphyxiated. The proportionately big list of fatalities among members of the rescue party was due, partly no doubt, to the fact that there were no resuscitating devices at hand. It was several hours after the disaster occurred before lung motors reached the scene. So far as it has been possible to determine, the workmen cut into a pocket of natural gas. The bore quickly became filled, and a terrific explosion followed. It was only after tests had been made showing the atmosphere below to be so highly charged with gas that a second detonation seemed imminent, that men could be kept back from the rescue work. The tunnel, which, it is estimated, will cost about $1,000,000 to build, was commenced two years ago. Until the present accident occurred, no life had been lost among those engaged in its construction. The tunnel is to connect a new crib that has been placed about four miles from shore, and is an extension of the one joining the old crib, closer in. The excavating work has been done from both ends, or cribs, and it was in the drift extending shoreward from the outer terminus that the tragedy happened.

WHITE CULVERTS WOULD END MANY ROAD ACCIDENTS

In Maryland the state automobile commissioner has proposed a scheme for preventing some of the motor-car accidents that are occurring on its highways in rural districts. The plan is not alone applicable to local conditions, but might be followed quite generally with beneficial results. The idea is to whitewash all of the culverts and low, inconspicuous bridges on state roads, so that they might be clearly seen by night drivers. Owing to exposure and the oil that is used to preserve the surfaces of the highways these structures eventually derive a dirty color that at night renders them almost indistinguishable from the roads themselves. As a result motorists occasionally strike the superstructures or drive into ditches. The whitewashing, it is estimated, could be done periodically at small cost and would result in a decrease of accidents.

THE RAILWAY IN WAR

By R. J. BJURSTEDT

WHILE prisoners of war, as a rule, can rarely be counted upon to tell the things they do know, it almost invariably happens that, directly or indirectly, they can be led to admit the things they do not know. Sometimes these more or less inadvertent admissions are of military value to their captors, in which event the outside world hears nothing of them; but more often they are merely amusing. From the fact that the stories of two German airmen who were shot down behind the French lines—the one in the early months of 1915, the other in the later—have been given to the public, it is to be presumed that, as far as the present military situation is concerned, they are only of the latter character.

The first of these told his captors that he had been sent to report on the motor traffic on a certain road over which it was known food and munitions were being supplied to the French troops holding a sector of the western front. He flew over a very busy light railway, but in searching for the road lined with motor traffic he got so far behind the lines that he was cut off and forced down by a couple of French machines. He was still wondering where the motor traffic was.

The other German flier in question, captured six months later, said he and his observer were sent to map the light railways in the rear of a certain portion of the front, but, not seeing any railways, he had kept on until he was cut off by a French battle plane and driven to earth with a broken wing. They were still wondering where those phantom railways were.

These two incidents reveal two important steps in the transition of transport on the western front. The railway, which the first flier saw where he had expected to observe a line of crawling motor trucks, had been got ready and thrown down almost overnight just as soon as it appeared certain that this particular road was to be a main line of supply for an indefinite period. Just what became of the light railways that the second flier sought is not stated in so many words, but one is allowed to believe that, like the defending armies, the scarcely less important twin lines of steel in the immediate region of the front have been "dug in"—turned into subways—to protect them from observation as well as from shell fire.

The enormous and increasingly important part played by the railway—everything from the four, six, and eight-track strategic trunks to the donkey-

How the Austrians Solved the Problem of Field-Railway Construction: These Sectional Members can be Laid as Fast as the Supply Train can be Unloaded

pulled and shoulder-shoved car lines in the trenches—is one of the most remarkable developments of the European war.

It was a good deal over a hundred years ago that the discovery was made that an iron-tired car could be pushed or pulled along a track constructed even of strips of wood with a mere fraction of the effort required to move a vehicle of equal weight and capacity over the best road that could be made. Far greater improvements have been effected in roads and road vehicles since then than in cars and rails—the motor truck and the asphalted highway of today mark a greater advance over the cart and the cobblestone pavement of the eighteenth century than do the steel rail and the steel wheel over the iron-rimmed wheel and the sheet-iron-covered rail of the same period—but for general economy in transport the advantage still remains decidedly with the latter. In carrying goods on land for any distance—for anything, indeed, beyond house-to-house distribution or delivery between closely contiguous cities where motor trucking saves one or two handlings—the railway, whether trolley or steam, is still supreme.

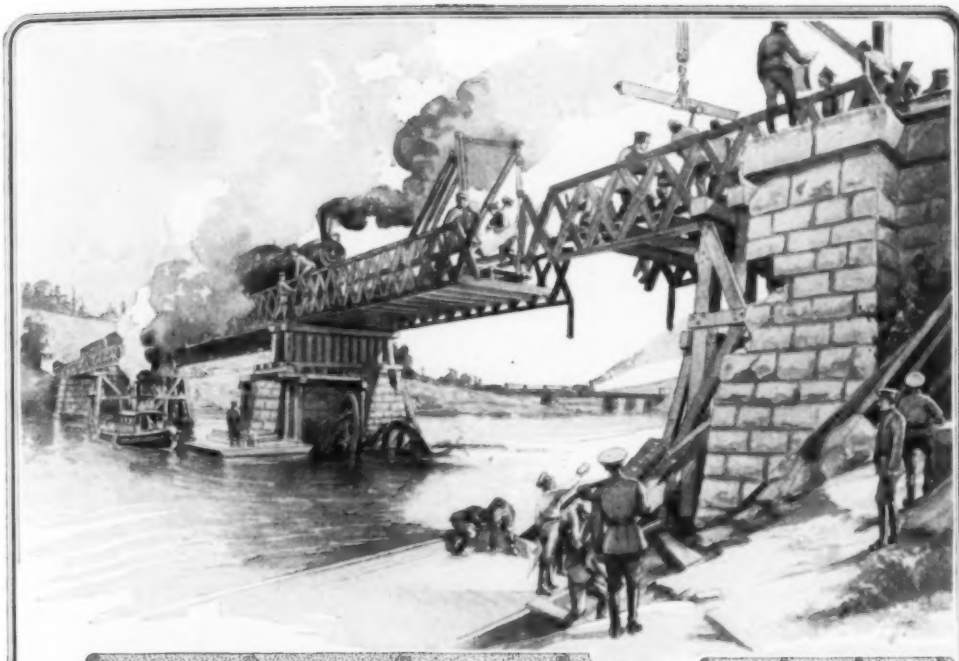
As in several other important considerations on the material side, Germany foresaw more clearly than did France or Russia the great part that would be played by the railway in the event of a general European war, and, as a consequence, she entered upon the present struggle with a system of strategic lines which was not only incomparably superior to that of her enemies to the east and west, but also one that has proved more nearly equal to the demands made upon it than the German army, the German navy, or even the efficient German munition factories.

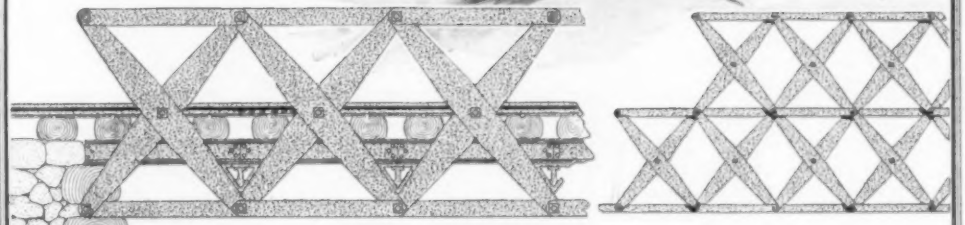
France's railway system might best be described as resembling the spokes of a wheel radiating from Paris as a hub. There were fairly adequate provisions in 1914 for rushing troops to her German frontier, but not for throwing them to the line where her frontier marched with that of Belgium, or for moving them back and forth behind the line from the North Sea to Switzerland, where the western front was finally established.

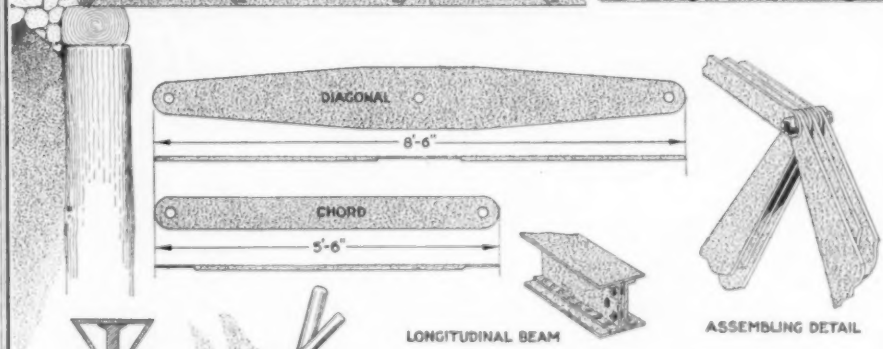
Germany's railway system, on the other hand, might be described as a cobweb, with its outermost strands reaching to her frontiers, about which the spider—her army—could move freely to attack or defend. It included all the lines that were essential to a complete and efficient commercial railway system, with the addition of a number that need never have been built if normal exigencies alone had been considered. These latter were mostly trunks connecting the eastern and western frontiers, branches from these trunks to convenient concentration points, and lines paralleling the frontiers. Even the most casual pre-war traveler in Germany could not have failed to notice how much greater were the railway facilities of certain towns than appeared to be warranted by their industrial activities. If he were to return there today, however, he would understand the reason for the apparent anomaly. The "over-railroaded" towns were concentration points for men and material: "ganglions" of the German strategic railway system.

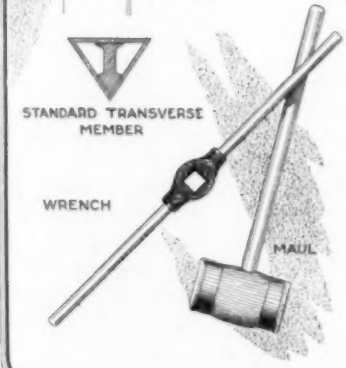
Germany built up an excellent motor-truck system, but kept the railway as the "wheel horse." France banked heavily on the motor truck and failed to build adequate strategic railways. Just how much of a price France has paid for this neglect it is impossible to say, but it is conceivable that the existence of such a system might well have made it possible for her to have forced the establishment of the present front well inside of Belgium and very close to, if not across, the Alsatian frontier.

It would not for a moment do to overlook the incalculable service motor transport has rendered to all of the belligerents. Von Kluck was thrown back at the Marne by a French army dropped on his flank from the hastily requisitioned taxis of Paris, and "unconverted" London omnibuses contrib-









GERMAN army engineers have so standardized railway-bridge building that substantial steel structures are now built in less time than temporary wooden ones formerly required. Before rail connections can be established between an advancing army and its base, new bridges must replace those destroyed. Therefore the facility with which standardized structures can be assembled by unskilled workmen is important, as is also the fact that the length and strength can be regulated to suit various conditions. The steel parts consist of four standard members: diagonals a quarter inch thick and eight and a half feet long; chords of like thickness five and a half feet long, and transverse beams, which support longitudinal "I" beams on which crossties rest. A strong lattice girder is built by bolting a number of diagonal and chord plates together, as shown above. Wrenches and mauls are practically the only tools needed. As indicated in the drawing, double girders are formed when extra-long bridges are built.

uted greatly to the stubborn and vitally important defensive work of the first British contingent sent across the Channel. So, also, did motor transport play an incalculable part in the first swift German drive across Belgium and into France, and the great German onslaught upon Russia in the summer of 1915 would have been utterly impossible without motor trucks to do the work of the destroyed railways. But these operations seem clearly to define the limits to the economic employment of motor transport on a large scale. For emergency work, for following an army into a region where railways have been destroyed or never built, for the quick shifting of heavy artillery, the motor has no equal. But just as soon as an army settles down so that its transport moves along established routes, experience has proved that truck service cannot too quickly be replaced by that of the railway.

At the beginning of the war, some of even the heaviest of the German howitzers were fitted with caterpillar wheels or tracks, so that, drawn by specially built tractors, they were capable of considerable movement independent of the railway. In getting them into position against Liége and Namur, and at several other points in the early weeks of the war, some of these monsters were moved a number of miles away from the railways. They were, however, restricted to only the smoothest and most heavily metaled of roads, and all of these latter were torn up so badly that it was a common saying in Belgium that the "wheels" of the "42's" did more damage than their shells. Since the western line has been more or less definitely established, the big German howitzers have had rails laid straight to their emplacements, where even their shells are brought to them on little cars running on specially built tracks.

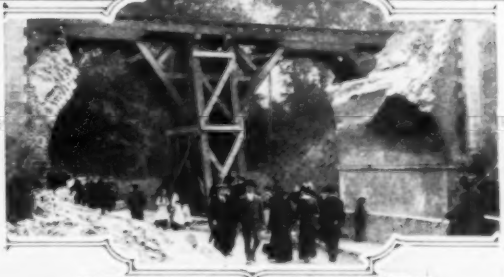
The terrible wear and tear of war traffic upon all kinds of roads has hastened the use of the rail. The cart and motor truck have given place to tramway and trolley wherever the movement is a regular one, and here and there one sees a single grooved rail employed to give smoother running for the wheel of a push barrow. In many of the camps little "kitchen railways" are employed to move around the huge caldrons of stew and tubs of dirty dishes without cutting up the ground with carts or barrows. A recent French bulletin told how a countermining party, after blowing up the enemy's tunnel, brought back two wounded German prisoners on their railway! The latter was evidently a narrow track laid to carry a dump car in the French tunnel.

In railway destruction and reconstruction the war has developed nothing especially new. Bombings from the air have been the merest pin pricks, effective only when trains were derailed or stations wrecked. The vulnerable parts of a line are its tunnels, bridges, and culverts; and the dynamiting of these is the last work of the rear guard of a retreating army. If there is time, this is followed by the tearing up of the rails and ties. The rails are then thrown on fires made from the piled ties, the heat of which warps and twists them beyond further usefulness. When steel ties are used, as on most of the new light railways near the front, the destruction of the rails involves more time and trouble, as fuel for the fires has then often to be brought from a distance.

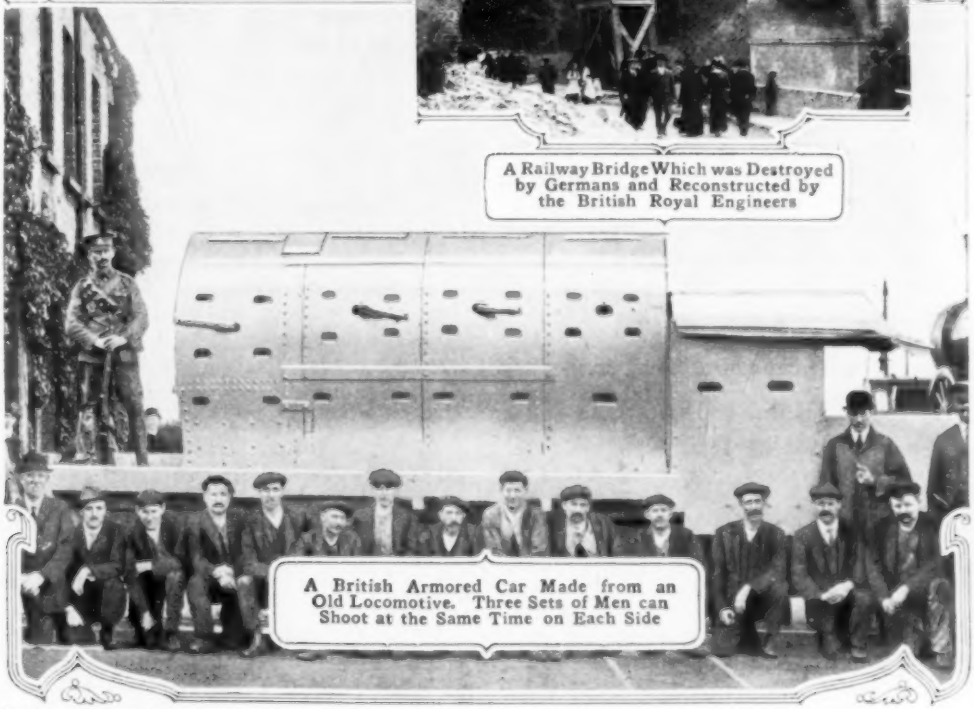
The Belgians made rather a poor job of their railway destruction, and the Germans, prepared to the minute against every contingency, were hardly more than thrown out of their stride by it. The problem of restoring these lines was almost identical with those confronting a wrecking crew in the United States, and the swiftness with which these latter work makes it easy to understand how little the Germans, with countless thousands of men at their disposal, made of such things as dynamited tunnels further blocked by the wrecks of piled-up trains. In several instances what had once been tunnels were reduced, in but a few days, to open cuts, by the simple expedient of throwing in men as thick as they

An Armored Train Operating on the Allied Railways at Verdun

One of the Interesting Pictures of the Belgian Invasion: German Engineers Spent Little Time in Repairing Wrecked Tunnels for Railway Service

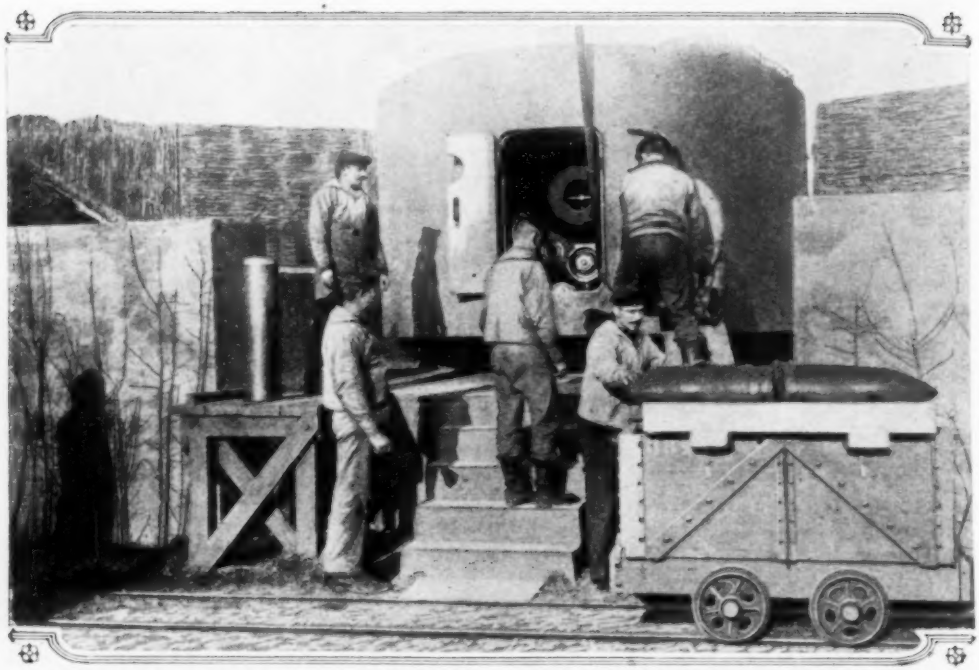


A Railway Bridge Which was Destroyed by Germans and Reconstructed by the British Royal Engineers



A British Armored Car Made from an Old Locomotive. Three Sets of Men can Shoot at the Same Time on Each Side

PHOTO BY BOSTON PHOTO NEWS CO.



An Armor-Plated Gun Turret Now in Use on the Flanders Coast. A Notable Instance of the Use of Railways for Supplying Weapons with Ammunition. The Projectiles are Carried on Specially Built Cars

could stand and swing shovels, and passing the dirt down to trains which backed in at the bottom on the relaid tracks. The fact that all of the tunnels in the war zone—in all of Europe, in fact—are lined with masonry instead, as in the case of so many of those on the railways of the American West, of being timbered, makes it impossible to set them afire. Had such construction prevailed, the slowness with which tunnel fires can be combated would often have deferred the restoration of traffic indefinitely.

The Serbs, on their line along the Vardar, performed a far completer work of destruction than did the hard-pressed Belgians. The almost endless succession of bridges and tunnels and its great amount of rock work rendered this line especially susceptible to a systematic tearing to pieces, and it has recently become known that the resourceful Serbs accomplished this most effectually. Not only were the tunnels and bridges thoroughly blown up, but numerous little surprises in the form of cunningly concealed mines were well calculated to give the impetuous Teuton pause in his campaign of reconstruction. The many weeks that elapsed before the imperatively demanded connection was opened between Germany and Constantinople is itself sufficient indication of how well the Serb wrought—or rather unwrought.

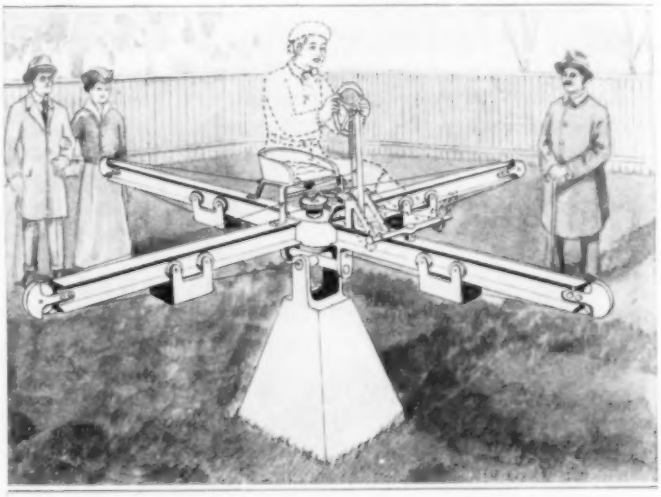
In the case of a properly destroyed bridge across a broad river, there is little to be done but to make such use as possible of the parts of any piers that may remain, and such material as may be salved, and build the whole structure over again. This entails the breaking of rail traffic and the institution of cart or motor transport over a pontoon bridge. The surprisingly short time in which the Germans had trains running over some of the destroyed bridges of Poland would seem to indicate that the work of the retreating Russians was far from being effectually done.

Culverts, road crossings, and short viaducts can often be patched up so as to pass carefully run trains within a

few hours, and an advancing army always aims to have the necessary materials — principally heavy timbers — waiting to be brought up. When these fail for any reason, as not infrequently happens, the nearest available substitutes are thrown into the breach. The Germans restored several crossings with the heavy timbers—some of them elaborately carved—of a French château, torn down for that purpose, in their first drive into Champagne; and in facilitating the pursuit of the retreating Von Kluck a quick-witted French engineer used a half dozen wrecked and abandoned German motor trucks to hasten the raising of a dirt fill he was compelled to make in the absence of bridging material. This precarious expedient, it is interesting to learn, was successful to the extent that it passed safely a number of trains bearing the urgently called-for troops, and only collapsed under a returning train of "empties" whose engineer carelessly exceeded the two-kilometer-an-hour speed limit set by its resourceful builder as the fastest gait his provisional embankment could be guaranteed to bear.

BALANCING MACHINE FOR AMATEUR AIRMEN

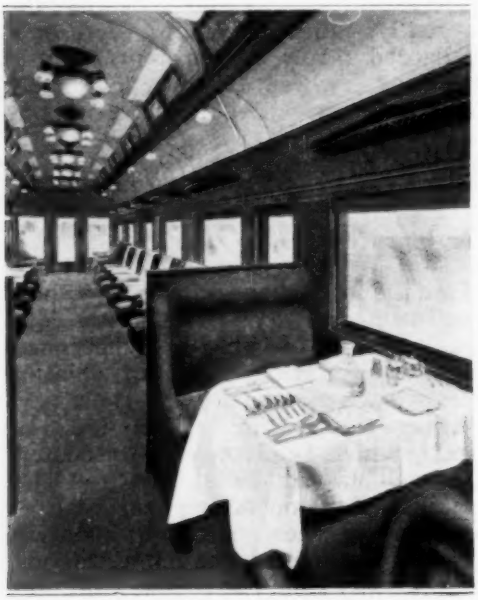
One of the essential faculties which must be developed by an amateur airman in learning to fly is the ability to keep the aeroplane balanced instinctively. Owing to the fact that the number of machines available for practice purposes is limited, it has been difficult for fliers in this country to have sufficient practical drill in this phase of aeroplane control. To meet this need, and also for the purpose of furnishing a perfectly safe means of instructing beginners, an Iowa airman has constructed a machine which can be fitted with various controlling systems. To maintain the equilibrium of this device requires all the operations necessary in keeping an aeroplane well balanced in a stiff gale. It consists of two long arms that intersect each other at right angles; by means of a universal joint they are mounted on a pyramidal base. Over the intersection of the arms is an airman's seat, a steering wheel, and a foot brace. According to one control system used on this machine the foot brace and steering wheel are connected by cables with four weights, one of which is suspended from each of the arms, along which it moves back and forth on wheels. By turning the steering wheel and the brace, which is pivoted at its center, the weights can be shifted and the stability of the operator affected correspondingly; when one weight is drawn toward the center the opposite one moves away from the center. Shifting the weights produces effects similar to those obtained by shifting planes in an aeroplane, but of course the danger of a fall is eliminated.



A Machine in Which Amateur Airmen can Develop That Instinctive Coördination of Their Muscles Necessary to Control an Aeroplane Properly

CAFE AND OBSERVATION CAR COMBINED

A small buffet compartment is included in a new type of observation and parlor car which has been put into

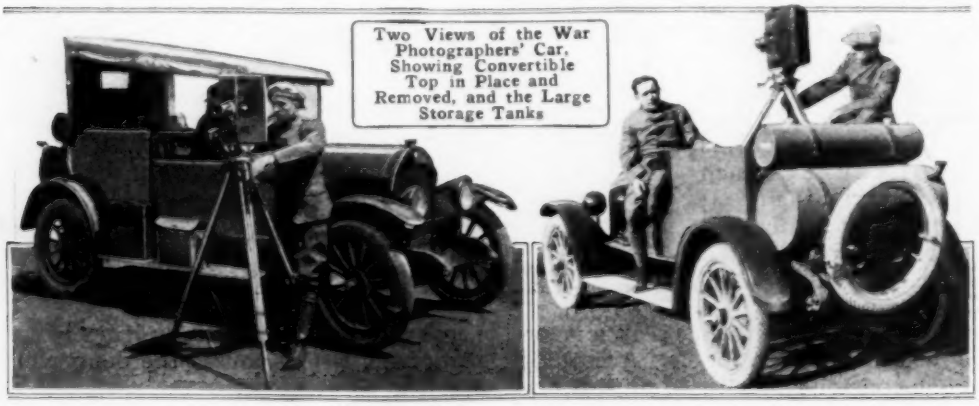


New Type of Observation Parlor Car Which Includes a Buffet with Accommodations for Serving Eight Persons at One Time

service by the Chicago & Northwestern Railway. Two dining tables, each seating four persons, are situated at the forward end of the spacious observation parlor. The high paneled backs of the two dining seats which face forward partly screen the diners from the view of the rest of the passengers. The kitchen is situated next to the dining tables and occupies about the center of the car. Forward of the cooking compartment is a completely equipped ladies' dressing room and a large smoking room. At the rear is a deep observation platform.

PHOTOGRAPHERS AT BORDER USE SPECIAL MOTOR CAR

Movie-camera men at the Mexican border for one of the pictorial news services are making use of a motor car that is especially designed to meet their needs. The machine is believed to be the first fitted out in this country particularly for those engaged in filming actual war scenes. It makes continual trips back and forth across the international line and has proved of great advantage to the photographers. The body, which is not of ordinary design, is built on a standard chassis. Immediately back of the driver's seat, and mounted on the frame, is a large square box which is used as a storage space for movie equipment and supplies, and also as an operating pit for the camera man when exposing films without leaving the machine. Space is allowed for a machine gun, should conditions warrant its addition to the equipment. A khaki top, which may be removed and converted into a sleeping tent at night, protects the occupants from the blistering tropical sun during long drives across sandy wastes. Suspended from



Two Views of the War Photographers' Car, Showing Convertible Top in Place and Removed, and the Large Storage Tanks

the rear are two large tanks. One of these is divided into two chambers so that it can carry a reserve supply of 15 gal. of water and 8 gal. of oil, while the largest holds 50 gal. of gasoline.

STUDENTS CULTIVATE HIGH SCHOOL'S LEMON GROVE

A three-acre lemon grove is an asset of the high school at Claremont, Calif., which not only gives the class in agriculture an opportunity to experiment extensively but also yields an average income of $500 per acre. The profits from this unusual adjunct to public-school equipment are used to aid athletics and social activities. The grove is situated just at the rear of the school building, and its cultivation is conducted under the supervision of the janitor of the school. All work of the students, excepting that of the agricultural classes, is done after school hours

View of the Three-Acre Lemon Grove Owned by the High School at Claremont, California, and Maintained by the Students

as extra work, and is paid for at the rate of $2 per day. In this way pupils assist in irrigating, pruning, spreading of fertilizer, etc. The services of one team are required about two days a month; the horses are hired for $4 per day. Occasionally it is necessary to call on neighboring orange growers to assist in the care of the trees.

OUTDOOR FIREPLACES IN KANSAS CITY PARK

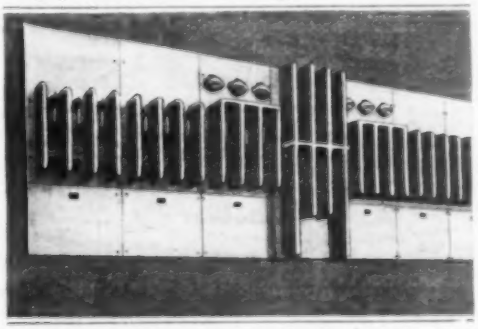
Ten outdoor fireplaces have been constructed in Swope Park, Kansas City, not alone for the convenience of the thousands who annually enjoy the park's 1,356 acres, but also as a protection against forest fires. Experience has shown that persons who are picnicking, particularly city dwellers, forget the necessity of fire precautions when in the woods and often leave

One of Several Rustic Fireplaces Built in Swope Park, Kansas City, for the Convenience of Picnickers and as a Safeguard against Forest Fires

camp fires smoldering which, unwatched, cause much damage. To guard against such carelessness the massive fireplaces have been built in clearings in the park and no fires are allowed elsewhere. They are made of limestone quarried in the park and built in the form of a large square chimney having an opening at one side at the bottom. Extending at right angles to the side having an opening are two low walls which serve to keep the fuel from being scattered.

PARTITIONS SEPARATE CLOSELY SET FUSES

A type of fuse board on which the fuses are set close together and yet are amply safeguarded against fire has



Marble Partitions Set Perpendicular to This Fuse Board Protect the Fuses, Which are Set Close Together, from Setting Fire to Each Other

been constructed for use in a western power plant. Small slabs of marble have been inserted between the fuses at right angles to the board so that there is no chance of one fuse setting fire to the adjoining one, despite their proximity. Electric meters above the fuses are easily protected by laying a slab of marble horizontally across the top of the partitions erected between the fuses.

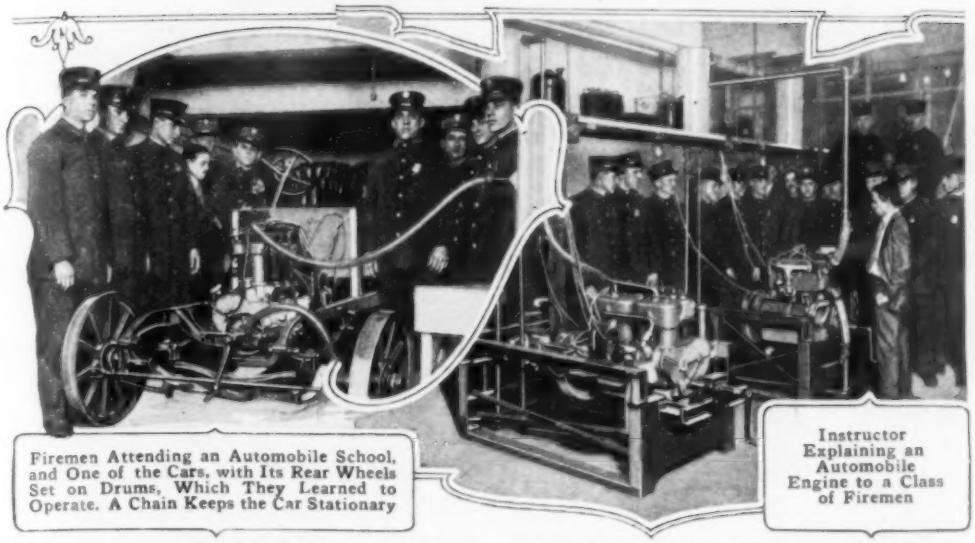
PRESERVE EGGS BY SEALING SHELLS HERMETICALLY

Both the process and effect of commercial sterilization of eggs—a comparatively new method of preventing deterioration—should be as interesting to consumers as to dealers. In California the system has been employed for several years, but it is just being taken up in many of the larger cities in other sections of the country. It consists, in part, of immersing the eggs momentarily in a highly heated, transparent, odorless, and tasteless oil of a high boiling point. This treatment opens the pores of the shells and enables the air and gas to escape from within. In addition to creating a partial vacuum, the heat thus applied solidifies the dual membrane lining the shell, vulcanizing the two thicknesses and cementing the resulting tough film to it. The oil furthermore fills all of the pores, so that the egg is hermetically sealed on both the interior and exterior. This prevents the evaporation of the content and also its contamination through contact with gases or liquids. In the case of a fertile egg, the heat stops embryonic development. No chemical change takes place and bacterial life on and in the shell is destroyed. It is asserted that, if freshly laid eggs are properly sterilized and sealed, they may be kept in cold storage for an indefinite period and upon removal will be found as sound and full as when treated.

CITY'S FIREMEN ATTEND AUTOMOBILE SCHOOL

The city of Milwaukee has been sending its firemen to school. Classes of 20 men each, composed of the drivers and engineers on the city's automobile fire-fighting apparatus, have been receiving instruction two afternoons a week for 25 weeks in the care and operation of automobiles and gasoline-driven pumps. On supplanting the old apparatus in the fire stations with automobile equipment, the firemen nat-

The Sterilizing and Sealing Process Is Entirely Mechanical, and the Eggs Remain Full and Sound for Long Periods When Properly Stored



Firemen Attending an Automobile School, and One of the Cars, with Its Rear Wheels Set on Drums, Which They Learned to Operate. A Chain Keeps the Car Stationary

Instructor Explaining an Automobile Engine to a Class of Firemen

urally were insufficiently trained to handle the latter. The placing of an automobile expert in charge of the men for a week or so after abandoning the horse-drawn apparatus — a practice which had been followed in some instances—was not believed to be adequate. No road work was attempted in this firemen's school, but the men learned a great deal about driving and repairing trucks, for the equipment of the school included four engines, mounted on testing stands, and two complete chassis with the frames chained to the floor and the rear wheels set on drums so that the pupils could operate them as if on the road. This same apparatus was also used by 75 boys, and by 300 men in night classes, so that in the course of the term the need of considerable actual repair work developed. The instruction was divided into two parts: Class work and laboratory, or shop, work. A particularly effective feature of the former was the use of a reflecting lantern with which illustrations from fire-apparatus catalogs were thrown on the screen and discussed, the question-and-answer method being used extensively. This largely took the place of a textbook, since the works available on automobiles deal chiefly with the construction and operation of pleasure cars of various standard makes.

SIMPLE SUNSHADE DEVISED BY TRAFFIC OFFICER

A Cleveland traffic policeman, who is assigned to a street corner upon which the sun beats fiercely in summer, has provided himself with a simple shelter which adds practically nothing to the weight of the semaphore that he operates and which he must move from time to time. The shade consists of a large oval piece of cardboard set on top of the signaling device. The metal arms of the sign serve partly to support the cardboard. To prevent sagging at the free sides, a cord has been tied to the edges and drawn taut so that they tilt upward a trifle. When wet, new cardboard can be substituted.

¶An offer to illuminate the Washington Monument for a period of one year free of charge has been made by a power company at Baltimore.

TWO-WHEEL ROLLER SKATE HAS NEW FEATURES

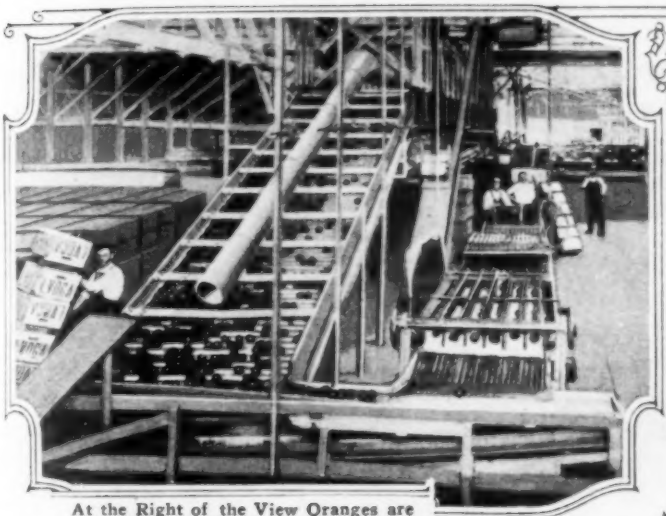
Two-wheeled roller skates of a new design, with restful braces for the ankles attached, have been introduced to devotees of the indoor rink. The front wheel is 3 in. in diameter, while the rear one is slightly more than a quarter of an inch larger. In the former, the pivotal point at the top of the fork is forward of the contact point of the wheel, so that the roller acts like a trailing caster. Most distinctive, however, is the fact that this wheel is capable of instantaneously accommodating itself to the direction pursued by a person's foot. Because of this, one can skate with the same easy curved strokes that are characteristic of ice skating, and do so without having to master the rather difficult rocking movement which is necessary if one is to use the customary four-wheeled type gracefully. Although the front wheel responds quickly to a skater's movement, turning to whatever extent is desired, it is alined by the pull of a strong spring the instant the foot is lifted from the floor.

DOCKET TWO CENTURIES OLD PRESERVED FOR FUTURE

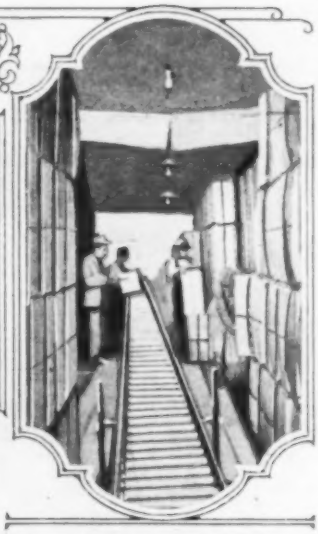
One of the oldest court dockets at Baltimore has recently been rejuvenated by an expert book restorer of the congressional library at Washington. Although the volume, which before treatment showed seriously the ravages of time, belongs to the superior court, its first entry was made in 1708 in a lower court before the present tribunal was established. Finger prints, stains, and dirt were removed from the large pages by steaming off several layers of the vellum and then treating the parchment chemically. Some of the leaves were torn and cracked. These were pieced together carefully, and, like others, reinforced with filmy silk gauze placed over both surfaces of each sheet. The ink withstood the cleaning process and is plainly visible through the protective gauze now in place. The volume will undoubtedly last many generations, despite the fact that its previous condition rendered it almost useless.

MODERN WAYS OF PACKING AND SHIPPING ORANGES

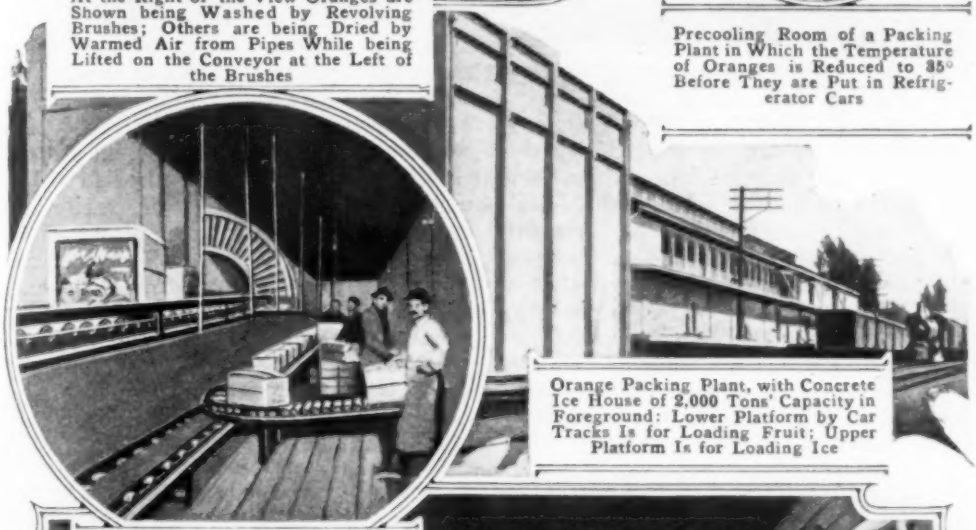
What is commonly called precooling is a process to which oranges are now subjected before being shipped—a treatment so beneficial that over 10 per cent more well-preserved oranges are now reaching points distant from California than formerly, thereby saving millions of dollars to the growers. These cooling establishments are erected in connection with the packing plants and sometimes cost as high as $50,000. The various steps in handling the fruit in these up-to-date plants are well illustrated by the methods employed in a modern establishment at Lordsburg, Calif. Here the oranges are washed by revolving brushes, dried by blasts of warmed air, and then graded and weighed by machinery, after which they are packed in cases. These are then carried by gravity on rollers to a cooling room which has the capacity of a freight car or more. Here the oranges are kept until they reach a temperature of 35°, which cooling process requires 30 or 40 hours. Cooled air is constantly forced into this room and the warm air drawn off. A concrete ice house with a capacity for 2,000 tons of ice, when filled, supplies the establishment with ice for a season. The crates of oranges are carried direct from the precooling room to the refrigerator cars. Canvas walls are stretched from the doorway of the car to the doorway of the plant to keep out the warm air while loading is going on.



At the Right of the View Oranges are Shown being Washed by Revolving Brushes; Others are being Dried by Warmed Air from Pipes While being Lifted on the Conveyor at the Left of the Brushes



Precooling Room of a Packing Plant in Which the Temperature of Oranges is Reduced to 35° Before They are Put in Refrigerator Cars



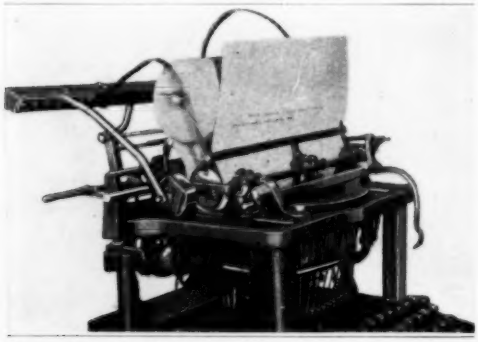
Orange Packing Plant, with Concrete Ice House of 2,000 Tons' Capacity in Foreground: Lower Platform by Car Tracks Is for Loading Fruit; Upper Platform Is for Loading Ice

Cases of Oranges being Borne by Gravity along Roller Conveyors, Thereby Eliminating a Great Amount of Hand Trucking

Packing Oranges in a Refrigerator Car: Note Canvas-Walled Vestibule to Keep Out Warm Air

DEVICE SUPPORTS PAPER ROLL FOR TYPEWRITER

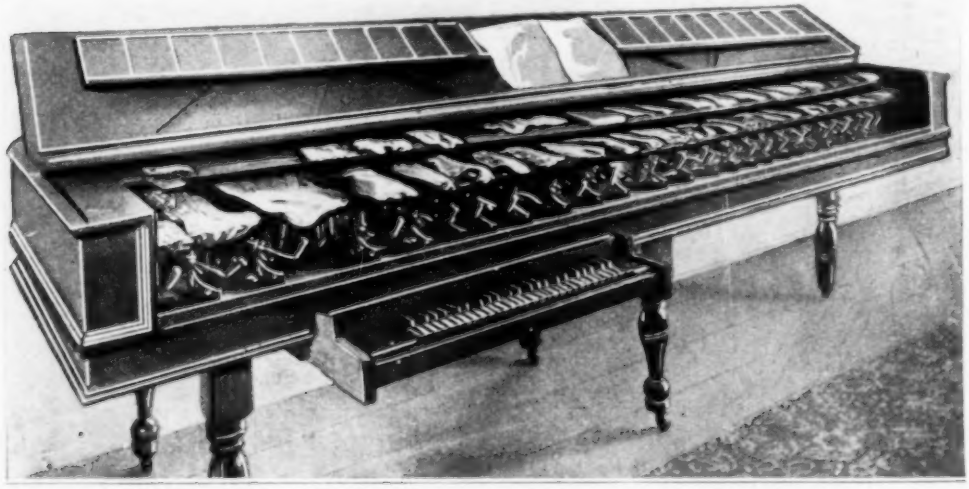
A saving in time in typewriting newspaper copy, or other material of such a character that speed is an important factor, can be effected by the use of a roll support which has been invented by a man in Glens Falls, N. Y. The attachment consists of a frame and roller mounted on the carriage of a typewriter and so positioned that a roll of paper, many yards in length, can be fed directly into the machine, thus making it unnecessary to remove and insert sheets of paper while writing. When one has finished a piece of work the paper may be torn off.



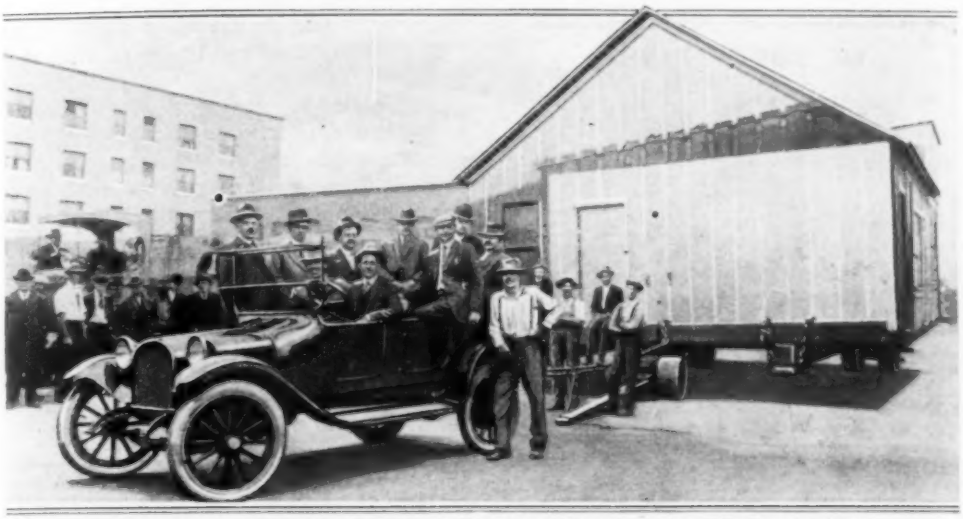
Typewriter Fitted with an Attachment Which Feeds a Roll of Paper into the Machine, Thereby Making It Unnecessary to Insert and Remove Sheets of Paper

NEW HAMPSHIRE MUSICIAN HAS QUEER INSTRUMENT

Carefully selected stones of a special kind take the place of metallic strings in a large musical instrument used in the home of a New Hampshire man. Although it is double the size of one, its cabinet and also the keyboard are similar in appearance to an old-fashioned square piano. Some 17 years were spent by the owner in constructing the device, which he calls a "rockophone." The tones are said by those who have heard them to be bell-like in their clearness and resonance. Almost any piano selection of average range can be rendered on the instrument. Literally thousands of stones were gathered and tested before the set of 43 now in use was completed. Each of these is of volcanic origin and produces a clear, liquid tone when struck. Short, narrow stones comprise those used in the upper register, while the bass members are each about two feet long and one foot wide. They are arranged in two tiers on special mountings in the cabinet and struck by wooden hammers operated by the piano keys. If desired, the instrument may also be played with mallets, the same as a xylophone. Its owner-builder values it quite highly.



Bell-Toned Stones are Used Instead of Wires in This Pianolike Instrument, Which Is 12 Feet Long



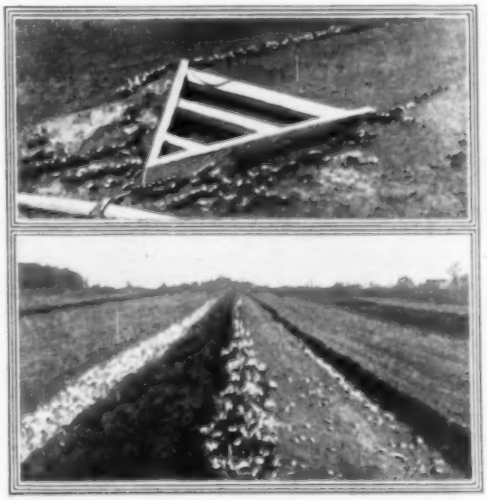
A 30-Horsepower Automobile Drawing a Three-Room Cottage at Long Beach, California. The Entire Distance Traversed Was 12 Blocks

SMALL AUTO DRAWS HOUSE TWELVE BLOCKS

A low-priced, 30-hp. touring car successfully underwent an unusual test a short time ago when it was employed to move a three-room cottage at Long Beach, Calif. The dwelling was set up on heavy beams and then mounted on three mover's trucks with wide-rimmed wheels. The chain by which the big load was drawn was fastened to the rear of the automobile frame. The structure was drawn 12 blocks without any difficulty, the engine running at low speed.

LABOR-SAVING DEVICE FOR INTRENCHING CELERY

The labor involved in storing late celery for the winter in dirt trenches in the field where it is grown, has been greatly reduced by truck farmers near Philadelphia by employing an implement built like a snowplow to throw up the dirt about the plants. The device, which thus eliminates a large amount of hand shoveling, and which might be called a grader, is made of two pieces of heavy plank, each about eight feet long and fastened together in the shape of a "V" by crosspieces. The celery is placed in trenches in the usual way and then five furrows are plowed about each repository. Three horses are employed to draw the grader over the plowed ground and three men are needed to operate it. One drives the team, another keeps the outer arm of the implement in the furrow farthest from the celery, and a third places his weight over the center or either side of the grader as needed. In this way a smooth ridge with slanting sides is thrown up about the celery, covering it all but an inch or two at the top.



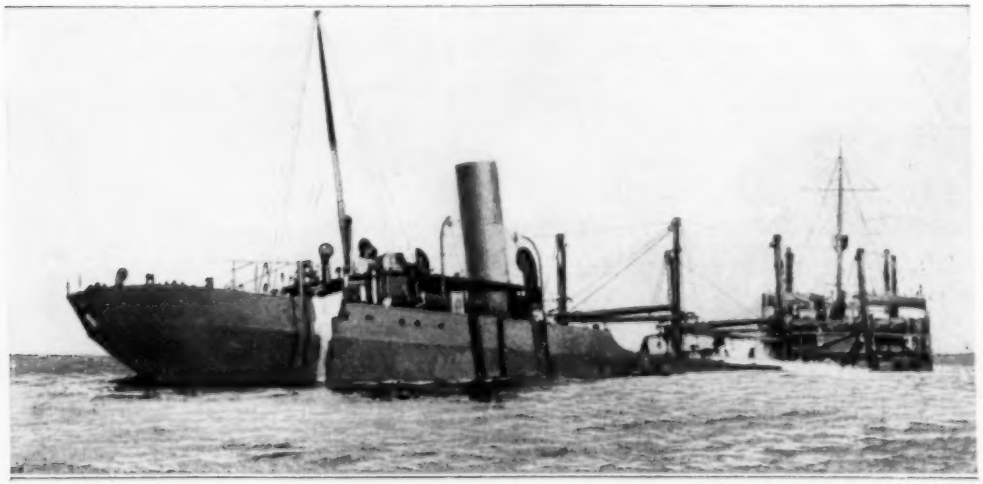
Above: Implement Drawn by Three Horses for Intrenching Celery. Below: The Implement Makes a High Ridge over Either Side of the Celery

PARCEL-POST CONTAINER OF TOUGH FIBER

A very tough fiber, similar to that used in making car wheels, is now utilized in the manufacture of parcel-post containers said to possess great durability and to be very light. The egg carrier which is made of this material is cylindrical in shape and incloses a set of partitions which radiate from the center. At the ends of the carrier are layers of corrugated paper. One of these containers filled with eggs can be dropped 3 ft. without breaking an egg, it is claimed. Not only is the fiber durable and light but it is a nonconductor of heat and cold, making it especially adaptable to the shipment of fruit, meat, vegetables, butter, etc. Bread kept in one of these holders was found, at the end of several days, to be in good condition. To minimize the labor of handling, several containers are often packed in a large bag.

Parcel-Post Containers of Light, Tough Fiber, Which Is a Nonconductor of Heat and Cold. Several can be Packed in a Large Bag

¶As a service experiment, two conductors are being used on a street car at Oakland, Calif. The duty of the second man is to assist passengers in entering and leaving the car, answer questions, and make himself generally useful and obliging. If the plan works out beneficially it is expected that extra conductors will be detailed to other cars.



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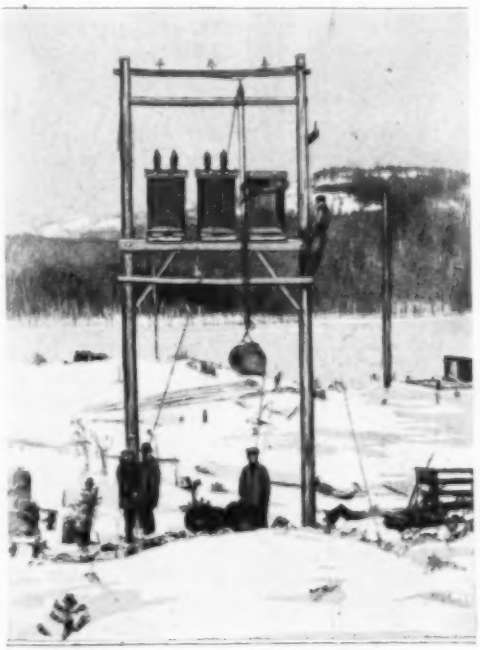
U. S. COLLIER "HECTOR" SINKS DURING STORM

CAUGHT in the midst of a terrific hurricane which swept the southern Atlantic seaboard July 13, the naval collier "Hector," with 52 marines aboard in addition to its crew of 12 officers and 70 men, foundered in 33 ft. of water off Charleston, S. C. The ship broke in two, but all hands got away in small boats and reached shore in safety. The collier, which was on its way to Santo Domingo, carried coal, oil, and supplies valued at about $500,000. It was laid down at Baltimore in 1909 at a contract price of $470,600 and had a displacement of 11,230 tons. It is considered likely that it can be salvaged and put into condition for future service.

FLOATING PUMPS SUPPLY PLANT IN EMERGENCY

Pump House Installed on Log Raft: Two Pumps Which It Sheltered Supplied Water to a Hydroelectric Plant When the Lowering Level of the Lake Threatened to Deprive the Plant of Its Regular Supply

Threatened with a serious shortage of water with which to operate one of its hydroelectric generating plants, a light and power company in Oregon last winter employed novel means of making more water available until the melting of the snow should replenish the small mountain lake on which the plant was dependent. The shortage was caused by the destruction of another of the company's generating plants, which occasioned excessive drain on the little lake in question. The depth of this body of water had been increased 34 ft. by erecting a dam at the time of building the plant to which the emergency call recently came. It was by the expedient of drawing water from below the original level that the difficulty was overcome. This was accomplished by installing two centrifugal pumps, with 4,500 gal. capacity per minute, on a 40-ft. log raft in the lake and pumping water to the main pipe line. Connection with the latter was made by laying on the ice and on pontoons two pipe lines made of sections of iron pipe having rubber sleeves. These temporary pipes readily adjusted themselves to the lowering surface of the



Installing Transformers for Transmitting Current to Pumps Housed on the Raft Moored on the Lake

water. Power for the pumps was taken from a near-by transmission line. The generating plant was able to produce its full capacity of 1,500 hp., while the pumps required but 50 horsepower.

COIN-OPERATED MACHINE VENDS HANDKERCHIEFS

A recent invention which marks the adaptation of coin-operated vending machines to a new field of merchandising consists of a device which will deliver one or two handkerchiefs, neatly boxed, to the person who inserts the proper coin into the proper slot and raises the corresponding lever. Twenty-four boxes containing one handkerchief each, and as many more boxes containing two each, are inclosed in a neatly finished case, made of pressed steel and having a glass front. The box measures 2 ft. high, 6 in. deep, and 16 in. wide. A 25-cent piece will enable one to secure two handkerchiefs, and a dime buys one of cheaper quality. The mechanism is so constructed that it will not release a box if a coin that is too small or too thin is inserted, or if it is too light or too heavy. Should a coin, or slug, become clogged in the machine, money inserted subsequently automatically drops through an "idle" channel and falls into a cup so that the prospective purchaser may secure it again.

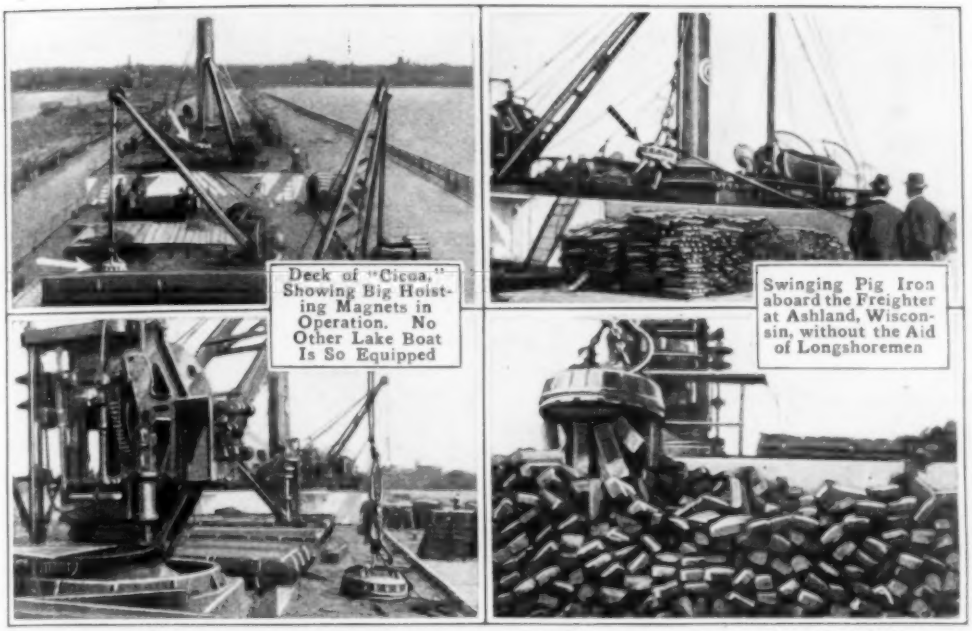
A New Vending Machine Which Sells Neatly Boxed Handkerchiefs to Anyone Inserting a Dime or a Quarter and Raising the Proper Lever

PROSPECTIVE DRUG GROWERS WARNED BY GOVERNMENT

Although high prices prevail at the present time for plants from which many of the drugs, oils, and spices consumed in this country are extracted, the Department of Agriculture is discouraging domestic agriculturists from turning from staple crops to this apparently highly profitable field. The reason is that not only intimate experience is required in raising such plants, but an overproduction is almost certain to result if many growers interest themselves in the industry. While it is entirely possible to grow belladonna, for instance, from which atropine and other valuable alkaloids are obtained, the total supply the country could consume might be grown on a very few hundred acres. Thymol, made from a seed grown in India, and which after the interruption of imports jumped from $2 to $17 a pound in a few days, the government has found can be obtained from horsemint, less than 1,000 acres of which would supply America's demand. The same is true in nearly all other instances.

INSTALL LIFTING MAGNETS ON LAKE FREIGHTER

Three large electromagnetic hoisting derricks have been installed on the deck of the Great Lakes freighter "Cicoa," which transports pig iron from docks at Ashland, Wis., and several Michigan ports, to Buffalo. This is

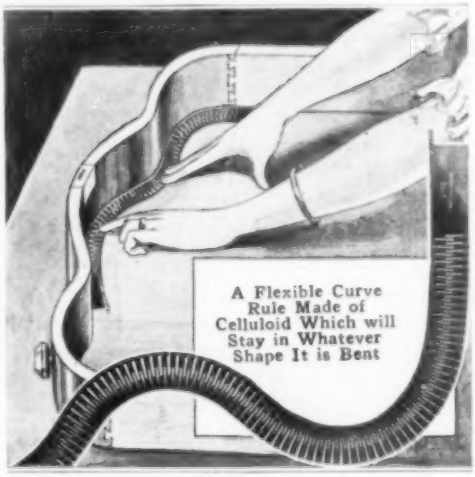

Deck of "Cicua," Showing Big Hoisting Magnets in Operation. No Other Lake Boat Is So Equipped
Swinging Pig Iron aboard the Freighter at Ashland, Wisconsin, without the Aid of Longshoremen

The Two Pictures Show How the Derricks are Mounted, and Give an Idea of the Size of Load One Magnet can Handle. When Working in Unison, the Three can Lift 4,500 Pounds of Iron at One Time

the first vessel on the lakes to be fitted with equipment of this kind. Each of the magnets is a yard in diameter and requires but one operator. Another man looks after the generator which supplies the necessary current. The first cargo, consisting of some 2,000 tons of pig iron, was taken aboard the vessel at Ashland a few weeks ago. The work was done with dispatch and at a cost of approximately $100. Formerly the loading had been done by longshoremen at an expense of from $500 to $600. When the trio of magnets is working in unison, 4,500 lb. of iron can be swung aboard at one time.

NEW STYLE OF FLEXIBLE CURVE RULE

Lightness and ready adaptability to irregular lines are characteristics of a flexible curve rule which an eastern firm has recently put on the market. The measuring device is made of black celluloid of superior quality; deep notches cut alternatingly in the two edges allow the rule to be bent easily to conform to almost any outline. It is held in whatever shape it is put by a pliable metal wire which is fastened to one edge, while the other edge is made continuous by a strip of celluloid which is slidably fastened to the ends of the parallel segments into which the body of the rule is divided. This form of linear measuring device is regarded as preferable to splines with which heavy weights are used to keep them in place.

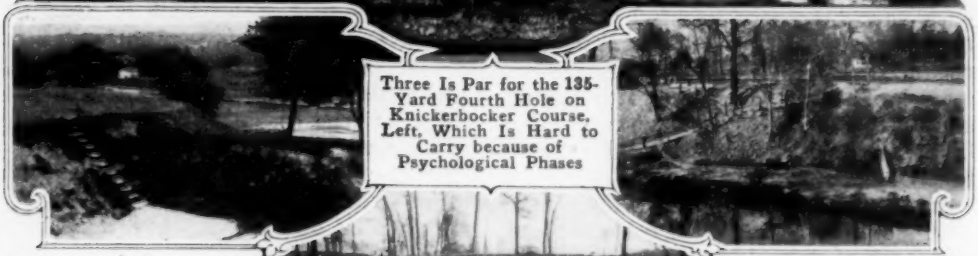


AMERICA'S ATTRACTIVE COUNTRY CLUBHOUSES

An Old Farmhouse of Revolutionary Times Is Original Part of Rambling Building Occupied by Essex County Country Club near West Orange, New Jersey

A Deep Ravine 200 Feet Wide Forms a Natural Hazard on Sixth Hole of Essex Links. The Green Is in the Midst of Trees on the Slope Ahead. Distance 415 Yards, Par Four

In Perfect Harmony with Its Name Is the Old Dutch-Colonial Home of the Knickerbocker Country Club of Tenafly, New Jersey, Pictured Below. Quaint Furniture is Used Throughout



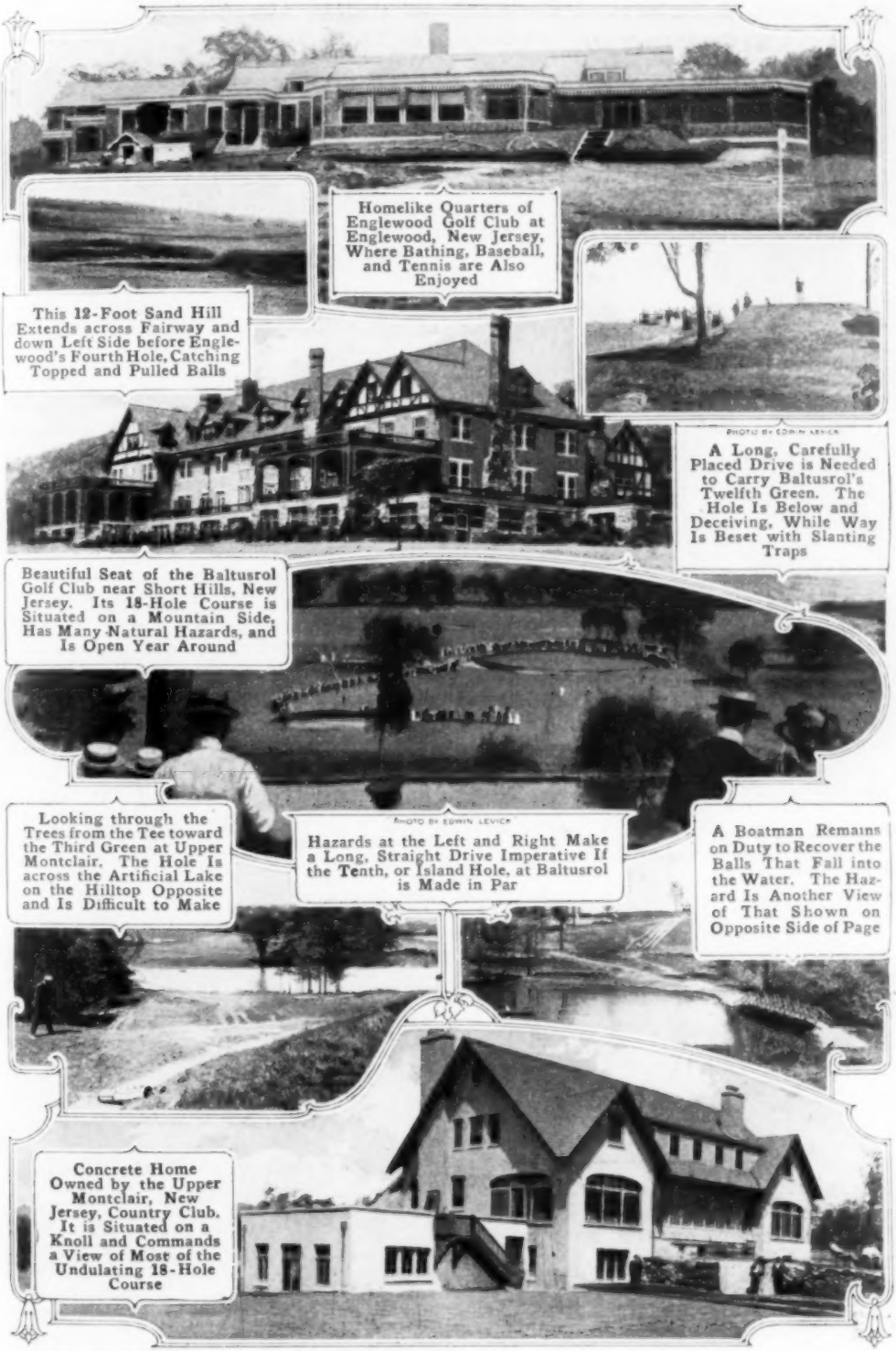
Three Is Par for the 135-Yard Fourth Hole on Knickerbocker Course, Left, Which Is Hard to Carry because of Psychological Phases

Seventh Hole, 75 Yards, Westfield Golf Club, Westfield, New Jersey. Probably Shortest Hole in East. Played over Natural Lake to Green on Hilltop. Par Three; Made in One

Above: Looking from Tee across River and Ravine to Eighteenth Hole, Forest Hill Field Club, Newark, New Jersey. Distance, 150 Yards; Par Three. Once Made in One

In 1770 Westfield's Clubhouse Was a Farmer's Dwelling. It Commands a View of Orange Mountains and Nine-Hole Course Stretching through Woods, over Hills, and across Meadows

AND SOME OF ITS BEST-KNOWN GOLF COURSES



Homelike Quarters of Englewood Golf Club at Englewood, New Jersey, Where Bathing, Baseball, and Tennis are Also Enjoyed

This 12-Foot Sand Hill Extends across Fairway and down Left Side before Englewood's Fourth Hole, Catching Topped and Pulled Balls

PHOTO BY EDWIN LEVICK

A Long, Carefully Placed Drive is Needed to Carry Baltusrol's Twelfth Green. The Hole Is Below and Deceiving, While Way Is Beset with Slanting Traps

Beautiful Seat of the Baltusrol Golf Club near Short Hills, New Jersey. Its 18-Hole Course is Situated on a Mountain Side, Has Many Natural Hazards, and Is Open Year Around

Looking through the Trees from the Tee toward the Third Green at Upper Montclair. The Hole Is across the Artificial Lake on the Hilltop Opposite and Is Difficult to Make

PHOTO BY EDWIN LEVICK

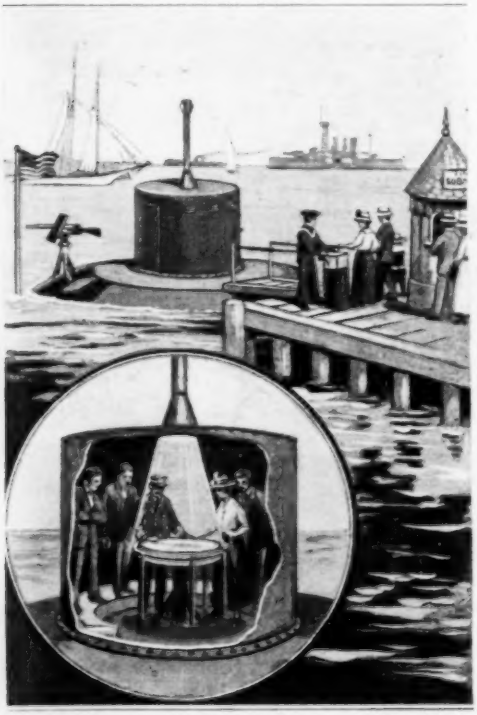
Hazards at the Left and Right Make a Long, Straight Drive Imperative If the Tenth, or Island Hole, at Baltusrol is Made in Par

A Boatman Remains on Duty to Recover the Balls That Fall into the Water. The Hazard Is Another View of That Shown on Opposite Side of Page

Concrete Home Owned by the Upper Montclair, New Jersey, Country Club. It is Situated on a Knoll and Commands a View of Most of the Undulating 18-Hole Course

SUBMARINE PERISCOPE USED AS AMUSEMENT DEVICE

In addition to the numerous other fields it has entered within the last year or so, the periscope has been introduced to pleasure seekers at summer parks. An eastern amusement company during the past season brought out a "submarine" attraction in which this instrument is employed. A shell, shaped to represent the deck of a partly submerged under-sea boat, supporting a steel conning tower fitted with a periscope, comprises the essential parts of the outfit. The "deck" is intended to be surrounded by water and is reached via a gangplank extended from an imitation dock at one side where the ticket chopper is stationed. The image reflected by the mirrors and magnified by a lens is cast on the horizontal surface of a three-foot round table placed in the center of the darkened conning-tower room, which is entered by patrons of the concession. The deck rests about two feet above water, while the tower is approximately seven and a half feet in height.



For Park Purposes the Periscope is Arranged to Throw an Image on a Circular Table inside the Conning Tower, Which is Mounted on a False Deck

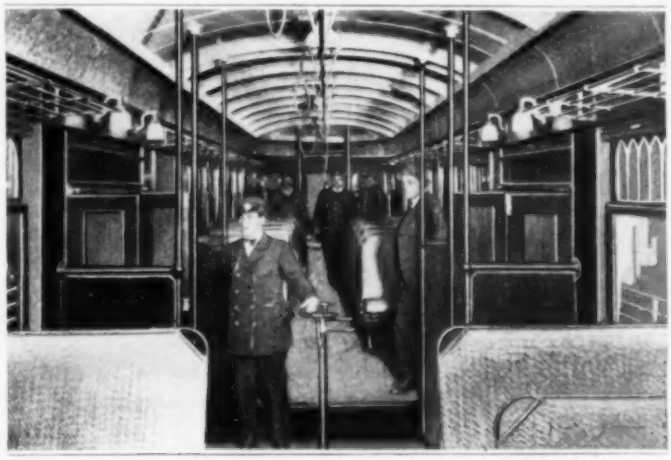
NEW MANUAL PUMP FOR BOAT OPERATED WITH ONE HAND

Intended as an accessory for small power boats, sailing craft, and fishing smacks which are not equipped with motor-driven appliances for doing the same work, a compact, manual pump is available which simplifies the task of bailing a boat which is shipping water in a choppy sea or leaking badly. Its outstanding feature is that it can be operated with one hand while the other is used to direct the course of the vessel or work the throttle. In using it, one simply rests the pump on the bottom of the boat, throws the free end of the discharge hose overboard, and pushes down on the plunger. It is not necessary to hold the pump itself in place with one hand or the feet, since the pressure exerted on the handle in pumping keeps the instrument in position. This is possible because a coil spring, within the cylinder, raises the plunger up at the end of each stroke. The device is fitted with brass expanding rings, and has no leather washers that might dry out during periods of nonuse.

The Pump is Held in Working Position and Operated with One Hand While the Other is Used to Manage the Boat

STREAMLINE ELECTRIC CARS FOR INTERURBAN SERVICE

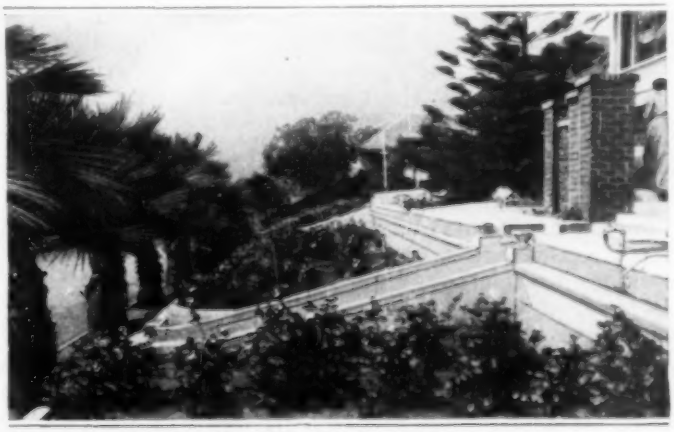
All-steel, torpedo-shaped electric cars have recently been placed in operation on an interurban system connecting Trenton, N. J., and a number of Pennsylvania towns. They replace smaller, slower cars which formerly maintained service between the former city and Princeton, a distance of 11 miles. According to advices, they are the first steel traction cars to be introduced in that district, and more than twice the size of equipment previously used. They are entirely inclosed and very economical of space, for the usual front and rear platforms are eliminated. Instead of being at opposite ends of the car, the doors are in the middle and attended by the conductor, who is stationed in a space provided in the central aisle. The cars are 52 ft. in length and driven by 200-hp. motors.



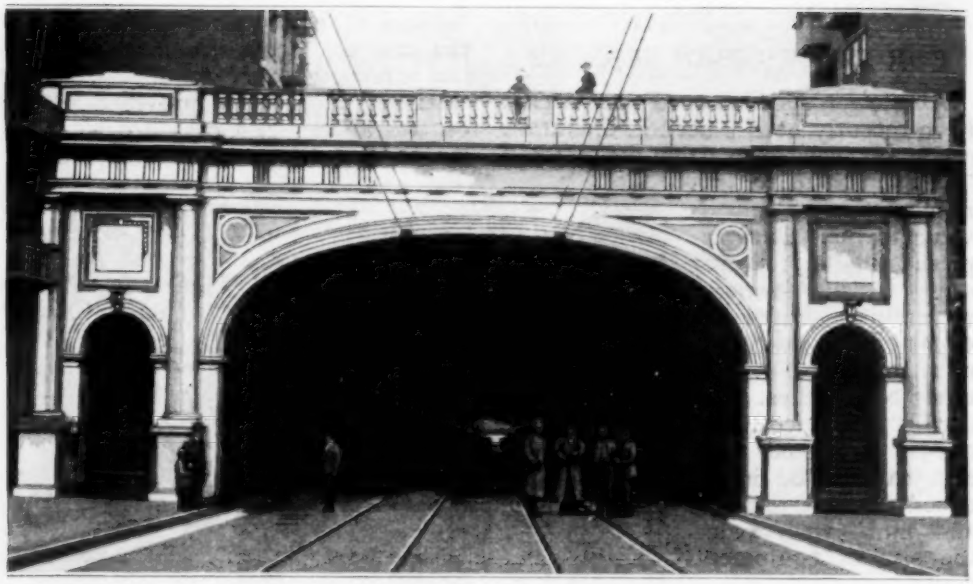
Interior of One of the Torpedo Cars, Showing Location of Doors, Which are Operated by Conductor Stationed in Central Aisle. This Is One of the First All-Steel Electric Carriers Placed in Service in the Vicinity of Trenton, New Jersey

STEEP NARROW FRONT YARD HAS ELEVATED GARDEN

An interesting California garden demonstrates the manner in which the difficulties of a narrow, steep front yard may be overcome. In this instance the porch is only 15 ft. from the street and more than 10 ft. above it. In place of the steep terraces usually employed in such cases a concrete retaining wall, 6 ft. high, was built next to the walk. The space between the forward part of the porch foundation, which was of concrete also, and this wall was filled with earth, graded so that it slanted a little toward the street. The house is approached by concrete steps leading up through the garden. Flowers and shrubs, such as could not have been planted on a terrace, have been set out in this elevated plot and can be admired both from the street and from the house. The flight of steps is set at a gradual incline.



A Six-Foot Retaining Wall at the Foot of a Sloping Plot Made Possible the Artistic Landscaping of a Front Yard That Was Both Narrow and Steep



Entrance to the New Stockton Street Tunnel in San Francisco, the Construction of Which was Marked by Several Unusual Features

NEW SAN FRANCISCO BORE A FEAT OF ENGINEERING

The construction of the Stockton Street tunnel, in San Francisco, which was recently completed, was marked by a number of features which make it an engineering feat of interest. The tunnel is 911 ft. long, with approaches 138 ft. and 275 ft. long, respectively. The arch is almost flat at the top, being 50 ft. wide and 18 ft. high at the center. Three drifts, 6 by 6 ft., were run the entire length of the bore before any lining was placed. The rock was next stoped out between the drifts. Because the arch was very flat and because ditches had been dug in the street above, practically the whole weight of the rock overhead rested on the roof of the tunnel. This made it necessary to employ especially strong temporary framework while the excavating was in progress. Two 17½-hp. electric locomotives hauled the dirt and stone from the tunnel. The bore is lined with concrete. Sand and stone were supplied for this part of the construction by gravity from bins located on the street above. The material was applied to the roof and walls by a patent pneumatic process. The mixer was stationed about 8 ft. from the placing machine and an 8-in. discharge pipe led from the bottom of a pneumatic drum to the section being concreted. About 16 cu. ft. of material could be delivered in one minute.

MILITARY HOSPITAL TRAIN BEING BUILT AT CHICAGO

Ten Pullman cars especially designed by the army medical department constitute a thoroughly modern military hospital train that is under construction at Chicago. Half of the cars will be provided with wide side doors to facilitate the loading and unloading of stretchers. These will be equipped with regular hospital beds. Two other cars are to be arranged like most sleepers, but fitted with medicine chests, ice tanks, and extra fans. One car will be used exclusively for operating purposes and be supplied with all of the necessary equipment. The capacity of the kitchen car will be adequate to meet the needs of more than 200 patients and their attendants. Each of the cars will be enameled in maroon and bear the insignia of the medical department.

THE LITTLE BOX THAT GIVES US MOVING PICTURES

By BURR C. COOK

THERE is a little box about two feet long and a foot and a half wide, mounted on a tripod, in which are born all the tragedies, comedies, laughs, and tears, that entertain three-quarters of the world.

"All right, go back and do that over again!" shouts a tall man who is squinting into the finder on this little box. "Be careful you don't move more than 15 steps or you'll go out of the picture," he calls to one of the actors.

"All ready? Camera!"

The man at the box opens the shutter of the lens and begins turning the crank.

"Clickety-clickety-click," goes the crank, two turns a second, or about 120 turns a minute. The actors go through their parts, the man at the crank keeps on turning with a steady, regular motion. And all the while a thin strip of film, about an inch and a half wide, has been registering every action, every emotion on the faces of the players, and winding it all up in about 400 feet of "canned drama."

"All right." The man stops turning the crank and consults an indicator on the side of the camera, which shows that he has used all but a few feet of the 400 ft. of film. He hastily spins through the few remaining feet and proceeds to open the side of the camera. Inside, in the rear, one on top of the other, are two small black boxes. A few minutes ago the top one was filled with unexposed film, now it is empty and the bottom one is filled. The little black boxes are closed tightly so that no light can get into them.

Operator at the Crank of His Camera: Above, and to the Right of His Hand, Is Another Crank Hole, for Spinning the Film Backward in Trick Photography. Farther Up Is Another Crank Hole Used for Close-Ups. The Indicator at the Top Registers the Feet of Film

The stage hands rush about, shifting the scene for the next setting. The stage director stands at one side, giving a group of actors their final instructions, and a boy comes running up to the camera man with three or four boxes similar to the one the man takes out. The boy takes the box of exposed film and rushes back to the developing room with it. Within about 20 minutes from the time the crank stops turning the finished film is developed, dried, and ready for the market.

In the long dark room, with its weird crimson light, a number of attendants are busy filling little black boxes, similar to the one the boy took from the operator, with new, fresh film. As rapidly as they are filled and sealed they are sent out to the machine operator, where they constantly replenish the magic box on the tripod.

The operator puts the new box the boy hands him into the top compartment of the camera, having put the empty box in the lower compartment. Next he pulls out the small projecting end of the film from the upper box, threads it through the upper set of rollers, down across the front window of the camera, and back into the lower box. He closes the cover of the small lower box after attaching the film, closes and locks the side of the camera, and takes a few turns to be sure that the spools are going to wind smoothly.

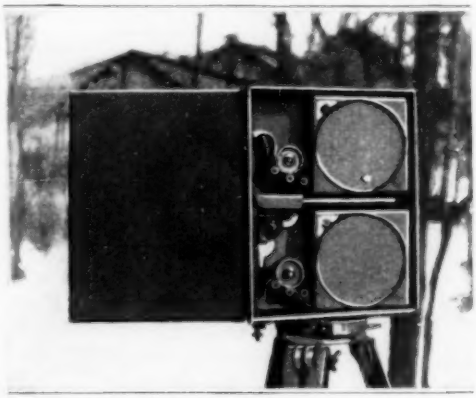
"All ready? Camera!"

Once again the actors engage in their pantomime. The man at the crank grinds the roll of film slowly past the window where it catches the impressions of the passing show and

winds up on the lower spool. This man at the crank is probably the most important personage in the studio. One slip, one misturn, and all the efforts go for nothing. The people who own the moving-picture films know that they must have an expert to take charge of the delicate organ that is the mainspring of the whole enterprise. The esteem in which they hold Mr. Camera Man is substantiated at a rate of $8 a day, on the average. The chief photographer or factory superintendent often receives a salary of $10,000 to $30,000 a year, and it is reported that one large firm pays their chief photographer nearly twice that sum.

But in spite of the fact that the working of the camera and the knowledge of its use is a most important item to the modern moving-picture concern, it is a comparatively simple apparatus.

"All you've got to do is learn how to turn the crank," smiles the expert operator. "Two turns a second, or about 120 turns a minute." But the expert operator makes it appear a trifle easier than it really is. In the first place, it takes a good deal of practice to know when you are turning a crank exactly two revolutions a second. In the second place, the camera often has to be moved up or down, or backward or forward, at the same time that the crank is being turned. The most vital part of the motion-picture camera, outside of the lens, is the mechanism for moving the film. Along the edges of the film there are tiny perforations which pass over a roller fitted with teeth which catch the film and pass it along steadily. In the best models of cameras the fingers which feed the film onto the rollers are on a cam drive, thus giving an intermittent motion, making it impossible for them to come in contact with the film while the shutter of the window is open. As a result the pictures are absolutely steady when projected on the screen.



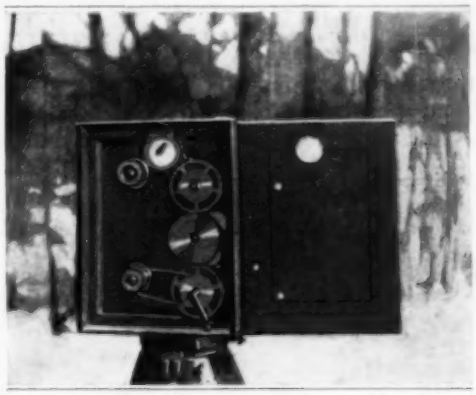
The Vitals of a Moving-Picture Camera: The Film can be Seen Passing from a Slit in the Bottom of the Top Box, under the Cogwheel, and Then It Buckles Up and Passes Down across the Lens Window. It Continues Down, under the Bottom Cogwheel, and into the Lower Box

"Come on, get some action into this," cries the director as the actors enter upon some particularly strenuous scene. Perhaps they are putting over a big scuffle in which a few chairs fly through the air. The camera man must not miss the flicker of an eyelash. He adjusts the slit on the front of the lens so that it will give an exposure of less than one five-thousandth of a second. The full opening is about one sixty-ninth of a second, so with the narrowed slit it is possible to get absolutely sharp pictures no matter how fast the movement. In addition to this, the lens on the head of the camera is fitted with a focusing jacket so that it can be used at varying distances. But the camera man does not turn the crank any faster, no matter how fiercely the leading man hurls the sofa at the deep-dyed villain. The sensitive, alert eye of the little lens, aided by the sharpened focus, catches every motion.

"Throw out your arms, and act frightened!" shouts the director as a young woman leans out of an improvised fourth-story window and shrieks for help. The hero rushes up to the building with a ladder and mounts to the window from which the smoke is beginning to pour very realistically.

"All right," calls the camera man; "I've got you—play it up strong." By means of a smaller crank at the head of the tripod he has followed

every step of the hero's "desperate climb" up the ladder, and now has it focused on the big scene at the burning window. No matter where the people move in the scene before him, they cannot escape the camera man. On the top of the tripod are two cranks, somewhat similar to the one on the side of the machine, and by turning these he can either raise or lower the camera, or turn its focus sideways for panorama. Of course, in the ordinary scene, the focus must be maintained within a certain width or else the bare, unattractive walls of the studio would get into the picture; but for street pictures, and outdoor scenes of all kinds, the camera man is completely prepared.



A View of the Reverse Side of the Motion-Picture Camera. The Entire Mechanism Consists of Three Cogwheels Which Work the Shutters and Fingers on the Other Side

The play goes on. The leading lady who has been mercilessly pursued through eight or nine different stage settings, finally comes to her "big scene." She approaches very close to the lens of the camera so that even the delicate rouge on her cheeks is in danger of detection, and proceeds to "register" emotion.

"Take your time," advises the director, who stands back of the camera man and supervises the action. For this "close-up" picture the camera man has fitted a smaller crank to another crank screw on the right side of the camera, which records one picture to each revolution of the handle. This crank is used for making pictures where the most minute movement is desired, such as the blossoming of flowers or the development of insect life.

The leading lady has finished her big scene, and the climax of the play approaches. The hero is supposed to see his sweetheart in the grasp of the villain through the convenient keyhole of a door.

"All right," calls the director to the villain and the heroine; "keep in the center of the picture this time. We're filming you through a keyhole." The actors are careful to keep within the direct center of the lens and the camera man turns the crank. Just before he begins this picture the camera man fits a small piece of steel—a mask as it is called—cut in the shape of a keyhole, on the back of the film window. This, of course, will form the outline of the picture when it is reproduced, and the effect will be that of peeking through a keyhole.

These masks come in all sorts of shapes and sizes. There is the opera-glass mask, the telescope, a crack in a board, and so on. The hero falls asleep in his armchair and the camera man films him, using a mask over the window, which has one corner filled in. After this part of the picture is taken, the film is stopped and wound back again to where it started, as shown on the indicator on the side. Another mask is now fitted over the camera window which has all the space filled in with the exception of the small corner which was filled before. The camera is again started and the hero goes through the scenes of his boyhood, which are registered in the small vacant corner. When the completed film is thrown on the screen the two scenes show simultaneously, and we see the hero asleep in his armchair, while up in one corner of his room the scenes of his youth pass in review in the form of a dream.

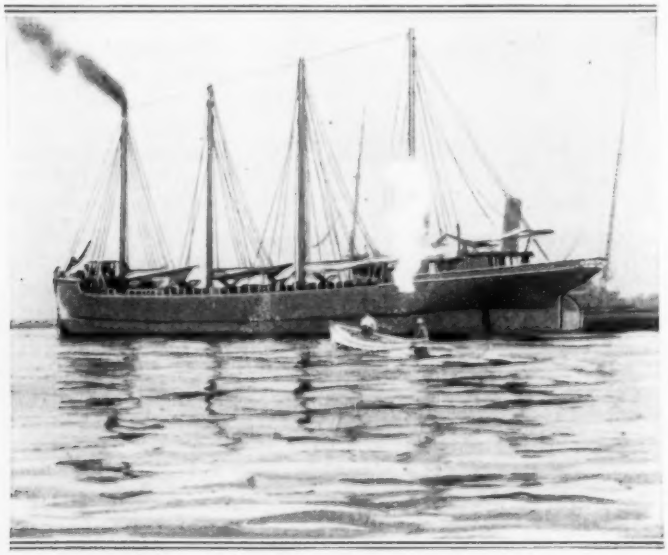
Many other tricks of the camera are brought about by running the film backward and forward, and by using

double exposure. By the latter method a ghost can be made to walk complacently through the walls of a room, and through the characters in a room, without disturbing anyone. This is simply done by first filming the ghost walking across the empty room and then turning back the film and rephotographing the same room full of people, giving a slightly longer exposure. The two pictures show together. The fading of one picture into another is also produced by the double exposure. When it is desirable to lengthen the perspective of a scene gradually, a mask is fitted over the lens which closes inwardly, until all that remains is the head of the hero or the heroine, or both.

It's all done with the little square box. All the most gorgeous scenery and costumes in existence, all the chains of motion-picture theaters throughout the country, all the millions invested in productions, and the millions spent in seeing them, come right back, in the last analysis, to the little box perched on the tripod, with its two small boxes inside, the thin roll of film, and the handy crank.

FOREMAST OF BARGES USED AS SMOKESTACK

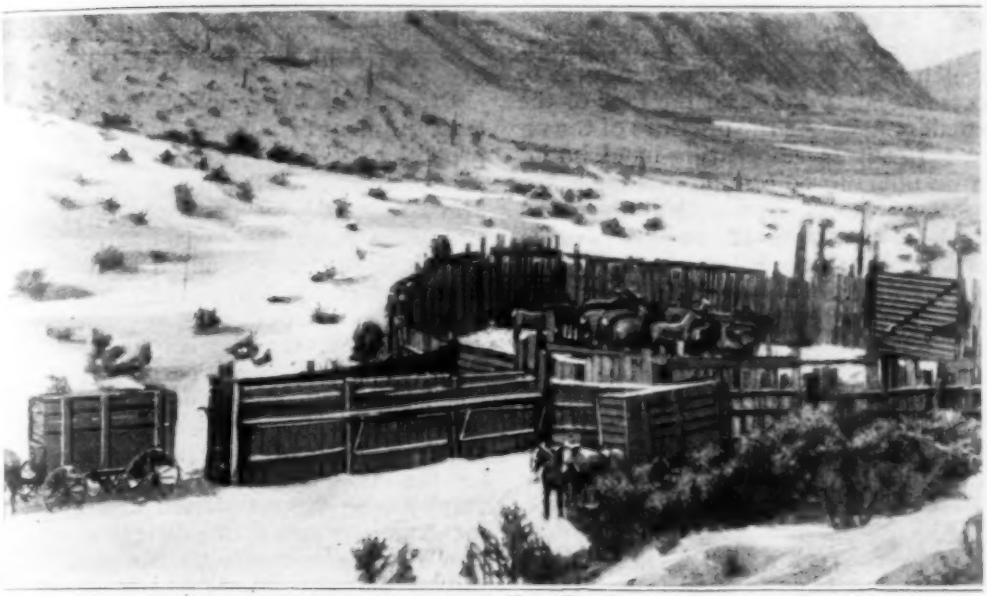
A number of four-masted oil barges which ply the Atlantic present the anomaly at mealtime of having clouds of smoke issue from the tops of the foremasts. While all of the masts of these vessels appear to be the same, the foremast on each ship is in reality especially constructed to act as a smokestack as well as a mast and is connected with the cook stoves. To a hungry crew, the smoking mast is a cheering sight.



An Oil Barge on the Atlantic, Showing the Foremast Used as a Smokestack

WOULD USE BONE DEPOSITS IN PRIBILOF ISLANDS

What the Secretary of Commerce designates as probably the largest known bone deposits in the world are to be found in the Pribilof Islands, in the Bering Sea. These deposits are the accumulation of more than a century and are the property of the United States Government, which acquired them along with other Alaskan islands and is now trying to devise some means for making this material, valued at millions of dollars, available to United States buyers. One of the many deposits is described as a mile and a half long, a mile broad, and from 2 to 6 ft. thick. These deposits, which because of the climatic conditions have retained their fertilizing properties, would be able to supply an unknown quantity of bones to be ground if only means of transportation could be devised. Since there is no regular steamship service to these islands, one plan proposed is to utilize the navy's collier on return trips.



Inclosure to Which Hungry Elk are Enticed with Hay: The Captured Beasts are Shipped to States That Guarantee Their Protection

CORRAL FOR CAPTURING ELK IN YELLOWSTONE PARK

During the winter of 1915-16 the Biological Survey captured about 500 elk belonging to the great herds that roam through Yellowstone Park and shipped them to states which had requested that their elk ranges be stocked anew. During the heavy snows the elk are driven down from the hills for food and sometimes they starve to death, consequently the government has adopted the policy of shipping some beasts to states that will guarantee their protection. A corral has been built near one of the feeding places and hay is scattered in its vicinity. Gradually some of the young will follow these "hay lines" until they are in the corral, whereupon an employe, concealed some distance away, pulls a rope that shuts and locks the gate. The captured beasts are then driven into a side corral and the performance repeated until enough have been captured to make a shipment. The animals are then loaded into wagons, carried to Gardiner, Wyo., and transferred to stock cars. There are about 30,000 elk in Yellowstone Park.

MAMMOTH PRESSURE GAUGE ADVERTISES GARAGE

A garage owner in Indianapolis has made the free compressed-air service which he offers automobilists a special advertising feature for his establishment by employing a mammoth pressure-gauge dial instead of an ordinary one, to show tire pressure. The glass cover of an ordinary gauge was removed and a long indicator soldered to the small one. This testing apparatus

The Window of This Garage Serves as a Dial for a Long Indicator Attached to a Pressure Gauge

with its extended indicator is set close to the plate-glass window of the garage, which has been painted with figures to correspond to those on the face of the small gauge. As the pressure of the air in a tire is increased this hand jumps from point to point and, of course, the pressure can be read with the greatest ease. Beneath the device "Free Air" is printed in letters several inches high.

CAR RUNS INTO LAKE AND LIGHTS ON ITS TOP

While attempting to drive up a steep hill near the lake shore in Cleveland, Ohio, a woman found that her automobile could not generate sufficient power to reach the top. When part way up the incline the driver lost control of the machine and it began to roll down the hill, and finally ran into the lake, overturning as it fell over the bank. The vehicle struck on its top in shallow water and remained in that position. The greater part of the body and the four wheels projected above the water. The woman who was driving and her companion were imprisoned in the car until a near-by fisherman rescued them.

Automobile Which Ran into the Lake at Cleveland and Lit on Its Top, Imprisoning but Only Slightly Injuring Two Persons

UNIVERSITY MEN TRAINED AS AERIAL FIGHTERS

Progress is being made toward the establishment of the aerial coast patrol, proposed by Rear Admiral Robert E. Peary and others, and the aerial reserve, fostered by the Aero Club of America. A complete coast-patrol unit is now being formed, and a number of Yale University men have reported to an aviation school at Port Washington, L. I., to be trained for it. The equipment of this, a New York unit, will consist of four aeroplanes as well as a number of motor cars and speed boats required for anti-aircraft operations. On the other hand, nine Harvard University men have reported at Buffalo for training under the direction of a San Francisco flier who has just returned from Europe, where, during two years of service at the front, he made 2,000 flights over the battle fields without experiencing a single mishap. A committee of Harvard graduates has contributed approximately $5,000 to a fund for training the men, and has given permission for calls for more money up to about $2,400. Ten thousand dollars more is required, and subscriptions for this fund are being solicited. All but two of the nine Harvard men are residents of Massachusetts. In the event of war their services would be at the command of the government.

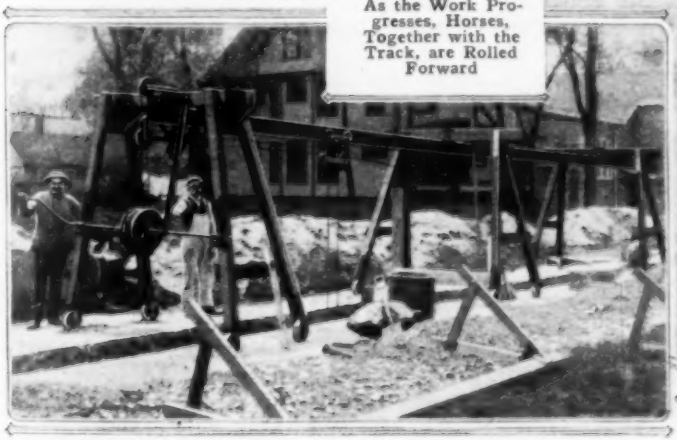
METAL IS APPLIED TO SKI BLADES BY SWISS

According to advices from Switzerland, it has been found that friction is materially reduced when thin layers of aluminum are applied to the bearing surfaces of a pair of skis. In addition to lengthening the life of the runners, it also has a tendency to prevent snow from becoming incrusted upon them and checking their speed. The plan has been tried out at a well-known resort in the Alps, where it has been found especially satisfactory for those who race over the snows behind horses. It is also intimated that the additional

speed derived from the metallized runners increases by several yards the distance it is possible for a ski jumper to leap. The aluminum is not applied in a strip, but is sprayed onto the runner in molten form. The layer of metal is about $\frac{1}{250}$ in. in thickness.

DIRT CARRIER AN AID IN RAPID DITCH DIGGING

A Wisconsin contractor has devised an equipment for use in deep excavating which enables men digging ditches to fill them in as fast as they excavate and lay the piping, without handling the dirt a second time. The equipment consists of a set of three wooden horses, 8 ft. high and 8 ft. long, mounted on wheels. These are placed across the ditch being excavated and support a 50-ft. suspended track. Attached to the foremost of the three horses is a windlass by which a bucket of ½-yd. capacity, suspended from a carriage resembling that used with a hay fork, is raised and lowered at any point along the track. When brought to the surface a loaded bucket runs to the rear end of the track and is emptied into the ditch for back filling. The gang of men shown in the illustrations was able to excavate and back fill at the rate of a cubic yard in five minutes. As the diggers moved forward the horses were rolled forward also. Thus practically no time was lost in shifting machinery.



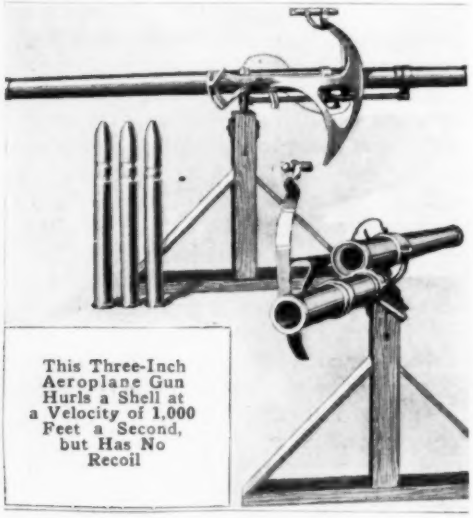
As the Work Progresses, Horses, Together with the Track, are Rolled Forward

Using the Equipment to Excavate and Back Fill a Ditch 27 Feet Deep

QUICK-SHOT AEROPLANE GUN FIRES WITHOUT RECOILING

Designed particularly as offensive armament for aeroplanes, a high-power, 3-in. gun of the quick-fire type has been developed which does not recoil when discharged. This distinctively new feature enables the instrument to be installed on a light machine of almost any size and fired freely without danger of shattering or capsizing the craft. The piece is unlike all other guns and is apparently suited solely for aerial purposes. Its bore is uniform throughout and has no surface upon which pressure can act longitudinally. The barrel, instead of being open only at the muzzle, is open at both ends. This permits the propulsion charge to act in two directions, thus obviating the recoil. The projectile is hurled from the muzzle toward its target at the same instant that a quantity of metal filings or fine shot is discharged

from the breech. After traveling a short distance the latter loses its velocity so that it cannot injure soldiers below at the rear. Although it closely



This Three-Inch Aeroplane Gun Hurls a Shell at a Velocity of 1,000 Feet a Second, but Has No Recoil

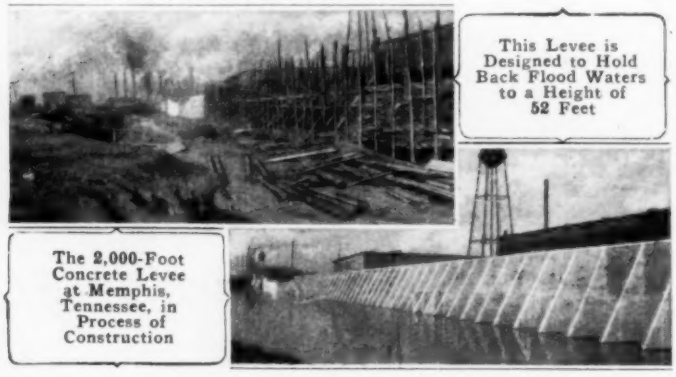
resembles that ordinarily used in pieces of the same caliber, the ammunition is specially made for the gun. The projectile travels at a speed of about 1,000 feet per second. Light process steel reduces the weight of the gun to the minimum.

SCIENTIFIC TIRES BUILT FOR AEROPLANES

More attention has been paid to the scientific development of pneumatic tires for use on the running gears of aeroplanes than is doubtless appreciated by persons not closely in touch with aeronautical matters. It has been found, for instance, that a light, resilient tire not only goes far in helping to absorb the shock encountered in landing, but also assists a machine in getting away. In the pioneering days, many kinds of tires were employed, even bicycle and motor-car types being used. Now, however, these early makeshifts are supplanted with tires designed to be equally efficient as those constructed for land vehicles. On ordinary machines, tires of large diameter are usually employed to provide an adequate cushioning surface to offset the lateral thrust that occurs when a craft sweeps to one side or the other in landing. On military reconnaissance machines, however, the cross section is reduced about an inch, to lessen the weight and permit more fuel to be carried. In other words, the tires are built to meet the requirements of specific classes of machines.

LONG CONCRETE LEVEE AT MEMPHIS

An excellent example of the use of concrete as a barrier against the encroachment of a river is the concrete levee which was recently completed along the water front at Memphis, Tenn., for a distance of 2,000 ft. In building this embankment, piles, which fitted together with tongue-and-groove joints, were driven to a depth of 40 or 50 feet, and reinforcing rods were placed at the proper distances, after which the concrete was poured in. At intervals of every few feet buttresses were built as integral parts of the wall, to strengthen it on the river side. The levee is designed to hold back 52 ft. of water by the Memphis gauge.



This Levee is Designed to Hold Back Flood Waters to a Height of 52 Feet

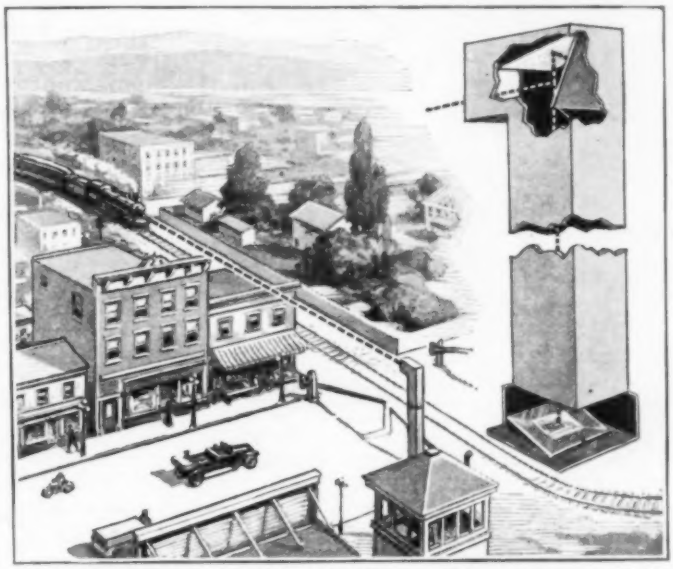
The 2,000-Foot Concrete Levee at Memphis, Tennessee, in Process of Construction

TOP TREES WITH DYNAMITE TO SAFEGUARD MEN

In constructing aerial logging rigs in the Washington forests, lumbermen use dynamite in topping the tall trees which are to serve as supports for the cables. The branches are first stripped to a height of about 150 ft. where the trunk is approximately a foot in diameter. The head rigger then buckles on his spurs and ascends to the proper height, carrying with him several sticks of dynamite strung together end to end like so many sausages. After fastening these about the circumference of the tree and inserting a detonating cap to which a long fuse is attached, he descends 20 or more feet, lights the powder string, and climbs to the ground. The subsequent explosion tears the top of the tree off and leaves the main part of the trunk ready for the cablemen. The process at first thought seems odd, but the reason for employing it is easily appreciated when one considers the danger a man subjects himself to by chopping and sawing off the top of a great tree far above the ground. By using dynamite he is able to do the work quicker and with less danger than if he were to remain in the tree while the top swept past him to the earth below.

GATEMAN USES PERISCOPE TO LOOK OVER BARRIER

A very practical application of the principle of the periscope has been made by a crossing gateman on the Santa Fe Railroad in San Bernardino, Calif. The view of the railroad track from the employe's shelter, where the gates are operated, is cut off by several buildings on the opposite side of the street. For the purpose of "looking over" these buildings and so learning of the approach of trains in ample time, the watchman has erected a wooden pipe, or flue, and arranged mirrors, periscope-fashion, at its upper and lower ends. The upper mirrors are about 20 ft. above the ground and reflect a clear view of the track to the lower one, conveniently placed in the gate house. With this aid the watchman is able to close the gates in ample time.



A Crossing Gateman in California has Erected This Periscope above His Shelter to Observe the Approach of Trains on the Far Side of Buildings Which Obstruct the Direct View

SPECIAL ELECTRIC FANS RID MARKET OF FLIES

The task of keeping flies away from meat, fruit, and vegetables openly displayed in a store has been made very simple in a large Philadelphia market by the use of 42 electrical "fly-chasing" fans. Because of the constant swinging of the doors, screens alone proved insufficient protection. Each of these fly eradicators possesses two wooden blades, having a sweep of 90 in., and set at a slight angle so as to create a very faint breeze which does not dry out or hasten the deterioration of the

food beneath them. Their speed is about 100 revolutions per minute. The reason assigned for their success is that each casts a shadow that is distinctly

Big Slow-Moving Fan Which Creates Little Breeze but Which Frightens the Flies Away from the Food Displayed beneath It

visible because of its slow movement, and this shadow frightens the flies away. One fan will keep away the insects within a radius several feet in excess of the length of the blades.

WOMEN STUDY CEMENT WORK AT COAST UNIVERSITY

During the summer months clay modeling and cement work were taught to a class of women on the campus at the University of California. The course was one of practice rather than theory and embraced several branches, such as the construction of ornamental flowerpots, urns, jardinières, and lawn vases, as well as cement sidewalks, curbs, and similar things. It was not an unusual sight to see young and middle-aged women carrying hods, working on their knees with trowels, pounding with tampers, using levels, and other tools of the trade. The membership of the class was not confined to local women, but included a number from different parts of the state and coast. Some of them ostensibly took up the work for its practical value, while several studied it in order to fit themselves for teaching it to others, particularly juveniles at city settlements and elsewhere.

PROPELLERS OF BIG SCOWS MADE TO RIDE OVER BARS

Two large scows, possessing twin 30-in. propellers that automatically ride over sand bars because connected with jointed shafts, and so capable of use in shallow waters, have been built for service on the Sushitna River and Cook Inlet, Alaska, in connection with the construction of the government railway. In these waters are many sand bars, and the scows often are liable to be caught on tide flats. The barges are 87 ft. long, 23 ft. wide, and 5 ft. deep; and loaded with 45 tons draw about 10 in. of water. They are powered with 80-hp. engines. Each propeller shaft is squared and fits into a square hole in the flywheel. Between the engine and the point where the shaft passes through the hull are two universal joints and a thrust bearing, which lat-

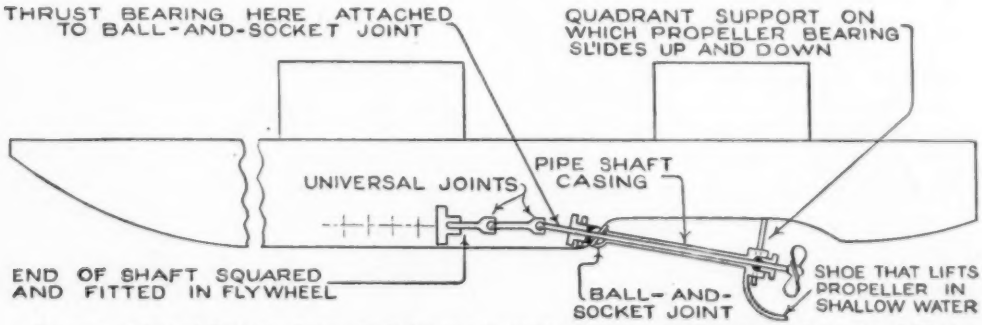

THRUST BEARING HERE ATTACHED TO BALL-AND-SOCKET JOINT
QUADRANT SUPPORT ON WHICH PROPELLER BEARING SLIDES UP AND DOWN
UNIVERSAL JOINTS
PIPE SHAFT CASING
END OF SHAFT SQUARED AND FITTED IN FLYWHEEL
BALL-AND-SOCKET JOINT
SHOE THAT LIFTS PROPELLER IN SHALLOW WATER

Diagram of One of Two Big Scows Built for Use in Alaska Whose Propellers are so Constructed That They Ride over Sand Bars or Other Obstructions in Shallow Water

ter is attached to a ball-and-socket joint fitted into the hull and provided with a stuffing box for the shaft to work through. On the outside of the ball-and-socket joint a pipe is screwed, in which the shaft runs, the pipe's rear end also being closed with a stuffing box. The stern bearing slides up and down on a bracket, and at its bottom is a shoe that extends under the propeller, so that the latter rides up over a sand bar or other obstruction in shallow water.

BULLET-PROOF MASKS WORN BY GERMAN FIGHTERS

From a source which is usually dependable it has been learned that the Germans are equipping their infantrymen with steel masks to shield the soldiers' faces from bullets. This signifies that once more during the present great conflict it has been found advisable to revive medieval war equipment. That the Germans are doing this is not to be wondered at, for both French and British trench fighters have been similarly outfitted for some time. The mask which is supposed to have been adopted for the kaiser's forces covers a man's face and forehead completely, the only openings in it being two small peepholes for the eyes. At the bottom it curves outward to facilitate breathing. Leather straps, which pass about the neck and head, hold the device in position.

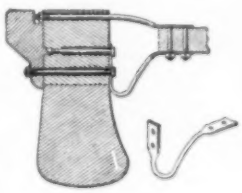
NEW TAPE-APPLYING DEVICE OF CONVENIENT SIZE

In Kansas an inventor has devised a light instrument of convenient size which facilitates the application of gummed tape when packages are to be sealed instead of tied. The device has a hatchet-shaped housing, inside of which the rolls of adhesive material are held. As the strip of paper is fed through a small opening at the bottom it is passed across a moistener. In addition to other things, portability is one of the advantages of this type of instrument. Instead of taking packages of various sizes to the machine to be sealed, as is necessary in the case of larger stationary contrivances, the tape feeder may be taken to them. The device may be reloaded without difficulty.

By Moving the Device across a Package, the Tape is Applied

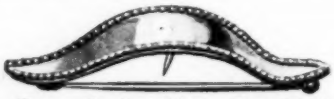
NEW AX HANDLE HAS SHOCK ABSORBER

A shock absorber for an ax has been designed, to minimize the vibrations which are felt in an ax handle when one is engaged in vigorous chopping. The handle of the implement fitted with this device does not extend into the head but is fastened to it by means of two short spring-steel rods. One of these is bolted to the upper edge of the wooden member and the other to the lower edge. The former extends through the head and is fastened by a nut; the latter describes a downward curve and is fastened to the head by two bolts. This gives the handle a resilient connection with the head without lessening the force of the latter's blow when it strikes into the wood.



SOME NOVEL AND LITTLE-KNOWN ACCESSORIES

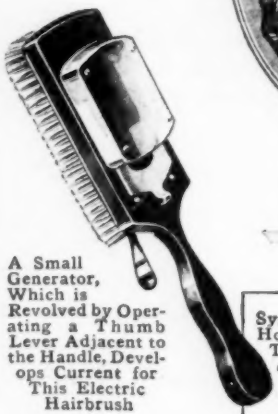
Combination Folding Pocket Scissors, Penknife, and Nail File Arranged Attractively in One Instrument: When Closed the Handle Is About Two and a Half Inches in Length



These Sterling-Silver Pins Hold Corsage Bouquets Firmly without Breaking or Crushing the Stems. They Make Acceptable Gifts and When Used Lessen the Chance of Staining a Gown When Flowers are Worn

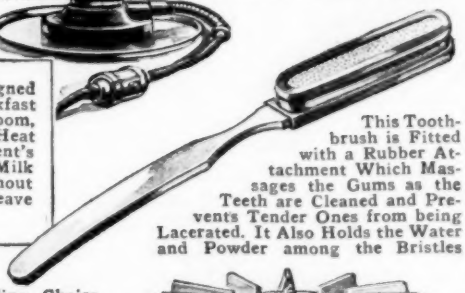
Transparent Guard That Fits over the Face of a Wrist Watch and Protects Its Crystal against Accidental Breakage. The Device Is Durable and Practically Imperceptible When in Place

Hollow, Feather-Weight, Ventilated Aluminum Balls That Fit over a Baby's Hands and Prevent Scratching, Thumb Sucking, and Nail Biting. The Hands are Not Cramped



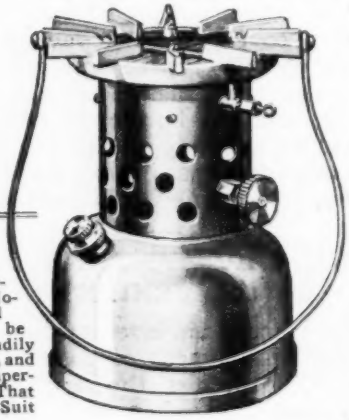
A Small Generator, Which is Revolved by Operating a Thumb Lever Adjacent to the Handle, Develops Current for This Electric Hairbrush

Symmetrically Designed Hot Plate for the Breakfast Table, Invalid's Room, or Nursery: It will Heat Water in a Moment's Time or Warm Milk for a Baby without Requiring One to Leave the Room



This Toothbrush is Fitted with a Rubber Attachment Which Massages the Gums as the Teeth are Cleaned and Prevents Tender Ones from being Lacerated. It Also Holds the Water and Powder among the Bristles

Light, Folding Chairs for the Tonneau of a Motor Car: When Closed They Are Less than an Inch Thick, and When Opened Provide a Comfortable Seat 16 Inches Square. Leatherette Forms the Seat and Back, While the Frame is Made of Metal Tubing

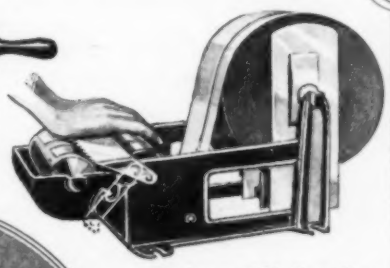


Portable Gasoline-Pressure Stove Especially Designed for Motorists, Hunters, and Campers: It may be Carried Easily, Readily Operated by Anyone, and Produces a High-Temperature Blue Flame That can be Regulated to Suit One's Needs

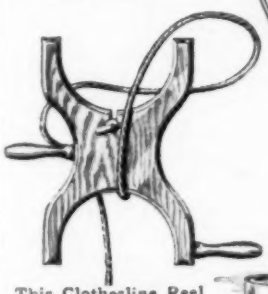
INTENDED FOR THE HOME AND ITS MEMBERS

By Giving the Knobs at Either End a Half Turn, a Toothpick is Dropped from This Aluminum Receptacle onto the Tray Below. In This Way the Supply is Kept in a Sanitary Condition

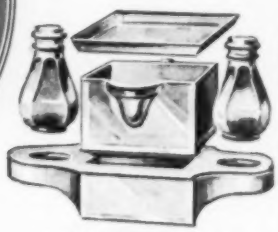
When Preparing Light Pastry, the Hollow Core Extending through This Glass Rolling Pin can be Filled with Chipped Ice so as to Keep the Cylinder Cool during the Time It Is in Use



Packages of Medium Size Containing Gifts or Other Small Articles can be Sealed Quickly and Neatly with the Aid of This Gum-Tape Machine, Which Is Suitable for Household Use

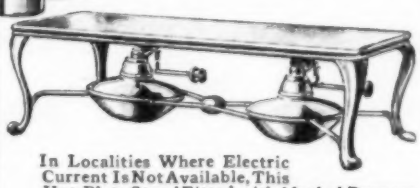


This Clothesline Reel will Hold 300 Feet of Light Rope and Keep It in a Neat, Compact Roll Free from Snarls and Tangles until Again Needed. When Winding, the Middle Handle Is Held Stationary and the Other One Turned

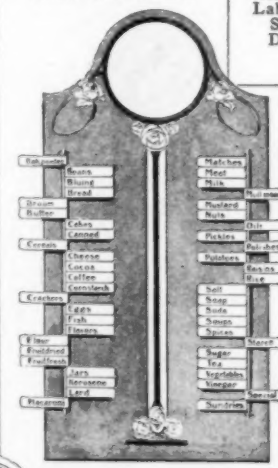


Individual Pressed-Glass Breakfast Service, Consisting of Sugar Bowl, Which Serves as Base; a Creamer, Fitting into Latter; a Butter Chip, Covering the Whole, and on Either Side Salt and Pepper Shakers

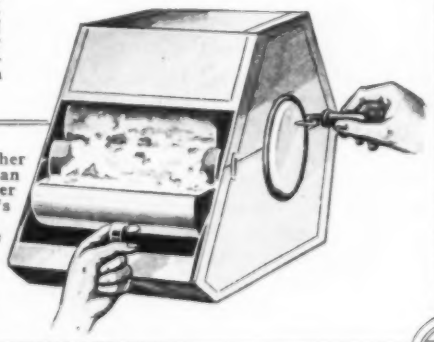
Simple Device for Sealing Tin Cans without the Use of Solder. When Fruits, Vegetables, or Meats are Canned in Large Quantities the Contrivance Saves Labor and Expense. The Sealing is Done by a Double-Seam Process



In Localities Where Electric Current Is Not Available, This Hot-Plate Stand Fitted with Alcohol Burners Serves a Convenient Function. It is Supplied with a Removable Aluminum Top and Is 18 Inches in Length



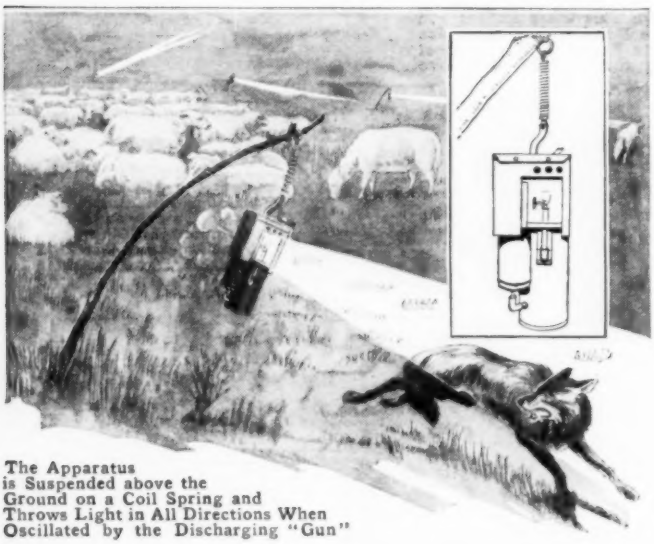
This Chart is Intended to Be a Constant Reminder of the Supplies Needed in One's Kitchen. It Eliminates the Trouble of Searching for Paper and Pencil, and Reinforces a Cook with a Poor Memory



An Ice, Sherbet, or Other Frozen Refreshment can be Made in This Freezer in Less than a Minute's Time. When Everything Is Ready for the Work, Delicacies of a Half-Dozen Flavors can be Prepared in Short Order

COYOTES KEPT FROM HERDS BY NOVEL GAS "GUN"

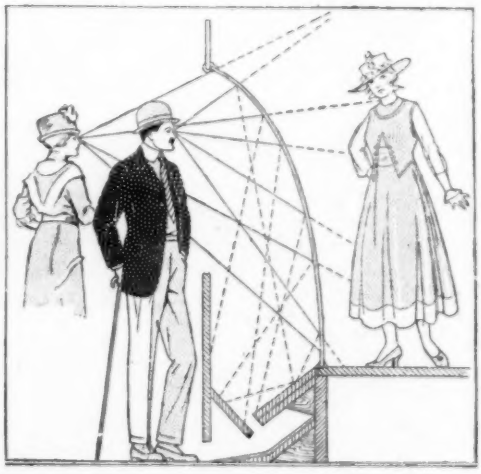
On several western ranches sheep and stock are protected from coyotes by means of a lately originated gas "gun" and lamp. As is well known, coyotes, like most wild animals, rarely approach a light after dark and invariably run when a gun is discharged. Grazing herds are usually watched over at night and a camp fire kept burning brightly. The necessity of this is apparently obviated by the new apparatus, which is entirely automatic in its operation. It is built with three chambers and a lamp house, and suspended above the ground on a coil spring. One of the compartments contains water which drips into a tank below it, filled with calcium carbide. Instead of all the resulting gas flowing to the jet, a certain portion of it is directed into the third chamber, a small cylinder which opens at one side of the flame. At one-minute intervals the gas in this "gun" explodes with a loud report. The vibrations from these periodical concussions cause the device to oscillate continually and move up and down so that the light is thrown in all directions. The "gun" is harmless, is reported to be effective, and will operate for about 14 hours, without requiring attention, at a cost of but a few cents.



The Apparatus is Suspended above the Ground on a Coil Spring and Throws Light in All Directions When Oscillated by the Discharging "Gun"

SHOW WINDOW WHICH HAS NO REFLECTIONS

A show window has been produced which is devoid of the reflections and glare that often render store windows useless for display purposes. It consists of a pane curving inward from a point about six feet above the walk, down to the window floor. A shadow box, or chamber, the inside of which is painted a dark, dull color, is formed at the foot of the window, the outer wall of this box being a barrier of suitable material, 3½ ft. high, set in line with the outermost portion of the window. After trying a great many curves one was finally obtained which throws all reflected rays into this shadow box. A series of baffles behind the barrier

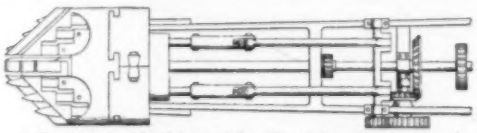


A Show Window, the Lower Portion of Which is so Constructed That No Glare or Reflections Interfere with Seeing the Display

serves to throw any dust or refuse that may collect behind it out onto the sidewalk, through openings in the bottom of the barrier.

TUNNELING MACHINE HAS DUAL-MOTION HEAD

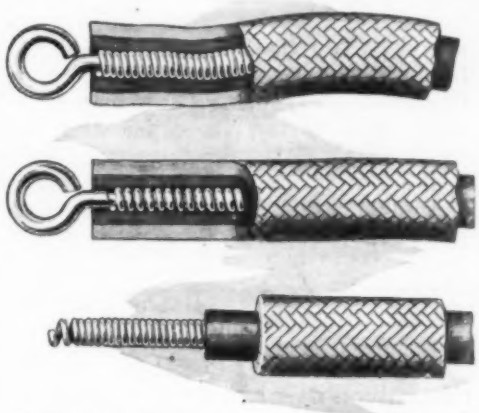
A tunneling machine has been patented which not only has a head that rotates but also a set of chisels that revolve and have a reciprocating action as well. The head is situated at the forward end of a framework which can be moved upward, downward, or sideways. The portion of the head that revolves only, called the cutter head, resembles a truncated cone, with triangular openings in its sides through which dirt may fall. Blades on this conical surface serve to shave off dirt loosened by the chisels. The latter are mounted on a tool holder which fits inside the cutter head; both are revolved slowly by a shaft extending lengthwise of the framework. The tool holder is fastened by means of a revolvable collar to pitmen that are connected with a crankshaft which imparts to the chisels a rapid reciprocating motion, which loosens the dirt thoroughly. The dirt falls into the head and thence through a rear opening onto a carrier.



A Tunneling Machine with a Rotating Cutter Head and a Set of Chisels That Revolve and Have a Reciprocating Action as Well

NEW TYPE OF CABLE BUILT FOR HIGH-TENSION WORK

Closely coiled steel wire forms the core of a new high-tension cable that is especially suited for magneto circuits in motor cars and for similar uses. It is protected with the usual type of heavy insulation and outwardly is of ordinary appearance. It has the advantage of resisting corrosion and will not sag, kink, or crack, since it does not depend upon the sheathing for support. Although it is not at all suited for low-tension circuits, the slight loss in voltage when a heavy current is carried is more than counterbalanced by the advantages derived. When used over or around a motor or generator, and properly strung, there is no danger of the cable sagging or coming in contact with the heated metal. To make a connection at a terminal, one of two simple methods may be employed. A screw eye, for instance, can be worked into the coiled spring and made fast, or a longer, wavy, unthreaded stem driven in place.



Showing the Construction of the Spring Cable and Two Methods of Making Terminal Connections

NEW SHOCK ABSORBER FOR AUTOMOBILES

A recently invented shock absorber for automobiles consists of an ingenious arrangement of levers and springs

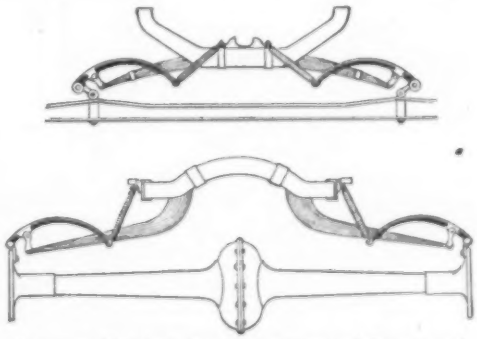


Diagram Showing the Arrangement of Levers and Springs in New Shock Absorber for Automobiles

by which, it is claimed, all shocks due to uneven roads are "ironed out" before they reach the body of the car. The principal feature of the device is a curved lever which has one end pivoted to the axle and the other suspended by a coil spring from the car body, there being two of these devices for each axle. A leaf spring, supporting the body and having its outer end suspended by a link from the curved lever a short distance from the point where the lever connects with the axle, completes the device.

MANY GOOD POINTS MARK GARAGE-DOOR HANGER

Several special advantages are possessed by a new hanger for garage and barn doors, among them being these: It allows the full use of the door opening; it needs a track only a little longer than the width of the door, and a door fitted with this hanger needs no hooking or propping when open, for it will not slam shut. If the door equipped with this device consists of two equal sections they are hinged together at the center to open outward, and one of them is hinged to the door frame. A track extends above the doorway and a few inches to the right and left of it. Fastened near the unhinged edge of the door, near the top, is a wheel which runs on the track. The door is suspended from the wheel by a swiveled rod that can be adjusted as to height, to take care of any sag. To open the door, a bar, bolted at one end and extending from one section to the other, is released from the lock at its unbolted end, thus allowing the sections to be folded up. When they have been pushed back the full width of the doorway, a catch, which can be released by pulling a chain, engages a shoulder at the outer end of the track and holds the door firmly in place. This style of door can be made thoroughly weather-proof.

This Hanger Needs Track Only above the Doorway, will Not Permit the Door to Slam When Open, and Allows the Use of the Full Width of the Doorway

HOUSEHOLD BILLS ARE PAID WITH MULTIFORM CHECKS

Multiform checks are issued by one of the national banks at Berkeley, Calif., to enable depositors to pay their monthly household bills conveniently. The form bears a printed list of nearly 150 merchants and business houses in the city and in using it one inserts opposite the proper firm names the amounts to be paid. The check is then forwarded to the bank, which attends to the rest of the routine. This makes it unnecessary for a person to write out a large number of separate checks each month and go to the trouble of mailing them. The expense of stamps for the latter purpose is likewise eliminated, an item which in the average Berkeley home amounts to 25 or 50 cents a month. Although the bank incurs an extra volume of work, the service is such as to attract new depositors, and it is this that makes it pay the institution. The plan has been in operation for a number of months and so far has worked out satisfactorily for all concerned.

THE CHILDREN'S PAGE OF NEW IDEAS

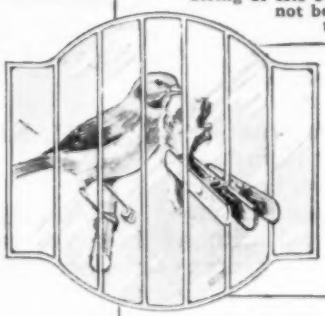
Wonderful Bubbles can be Blown with This Two-Stem Pipe Having One Bowl inside Another

A Gun That Spins a Top: Just Hang the Top to the Muzzle and Pull the Trigger and It will Start the Top Whirling

A Fine Three-Wheel Coasting Car That is Strongly Made

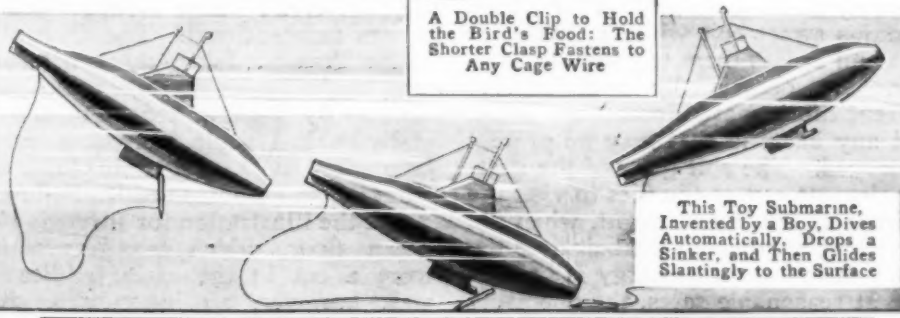
Two Pictures Showing a San Diego, Calif., Boy and a Toy Aeroplane That He Made: It Drops Bombs While It Flies, and Older Folks have been Wondering If His Idea could not be Used in the Army

A Nestlike Jumper in Which the Baby can Play and Then Sleep, If a Pillow is Put under His Head



A Double Clip to Hold the Bird's Food: The Shorter Clasp Fastens to Any Cage Wire

Portable Stand That Holds the Fish Bowl Up Out of the Way but in Full View



This Toy Submarine, Invented by a Boy, Dives Automatically, Drops a Sinker, and Then Glides Slantingly to the Surface

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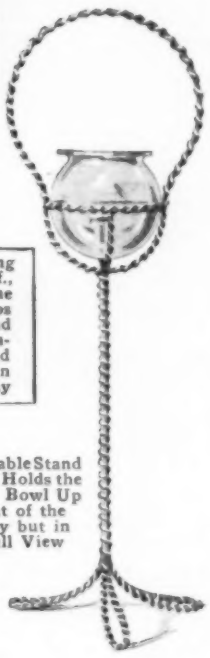

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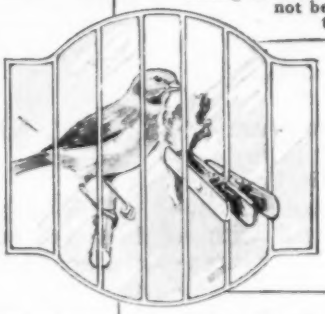

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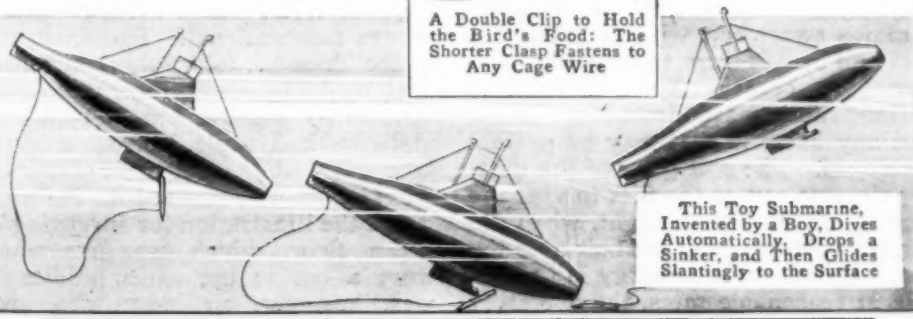
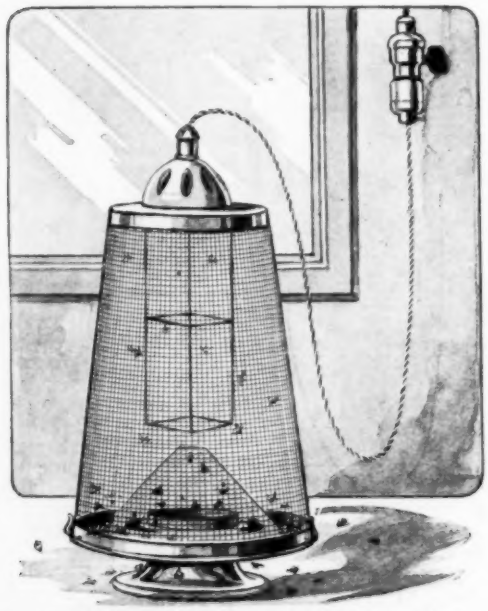


This Toy Submarine, Invented by a Boy, Dives Automatically, Drops a Sinker, and Then Glides Slantingly to the Surface

ELECTRIC FLYTRAPS USED IN CENTRAL EUROPE

Some German homes are being equipped with electric fly exterminators which are apparently almost as effective at night as they are during the daytime. The trap itself is similar to certain of the wire-gauze devices commonly employed in this country. In addition to this, however, it is supplied with a resistance element which when connected with a lighting circuit is heated to low incandescence by a feeble current. A shallow tray at the base of the contrivance contains sweet bait which attracts the flies and causes them to enter the interior. By occasionally applying the current the ensnared insects are killed, and any bacteria that may be present destroyed. The soft glow of the heating element causes the flies to visit the vicinity of the trap at night, when the current is left on, and the bait does the rest. When electric energy is procurable at reasonable rates, the operating cost of the appliance is small.



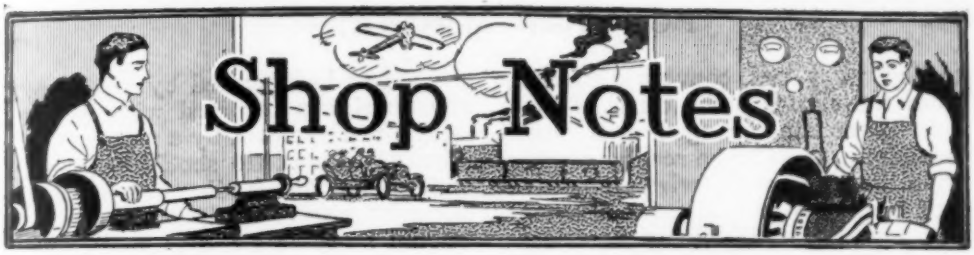
When the Trap is Connected with a Lighting Circuit, Its Resistance Element is Heated to Low Incandescence and the Flies are Exterminated

BOY SCOUTS INCORPORATED BY CONGRESSIONAL ACT

By an act of congress, which has received the signature of President Wilson, a Federal charter has been granted to the Boy Scouts of America. The purpose of incorporating the organization, which now becomes a truly national institution, is to protect it against detrimental imitation and commercial exploitation. The uniform, insignia, and badges as well as words descriptive of the body are protected by laws prohibiting their use by unauthorized persons, just as apparel of the United States soldier and sailor is safeguarded. All of which means that there can be no more neighborhood khaki-clad boy scouts unless each lad is a scout in fact, enrolled as a member of the national body. If a boy desires to act the part, wear a uniform resembling that of a soldier, and call himself a boy scout, he must subject himself to the discipline of the organization and carry out the prescribed obligations to abide by the scout law, help others, and keep himself physically strong, mentally alert, and morally clean. At the present time the boy scouts have more members than our army and navy combined.

THANKS TO SCIENTIFIC AMERICAN

This magazine has so many times been the recipient of courtesies from the Scientific American that the use of two illustrations from that journal without credit seems as ungrateful as it was unintentional. The illustration of the Treasure Island mechanical ship was made by us from a photograph sent us by the inventor, who failed to state he had made it from a sketch belonging to the Scientific American, from whom he borrowed it. Failure to credit the illustration for surveying the ocean floor, which was reproduced from a cut in the same publication, was, however, an inexcusable oversight.

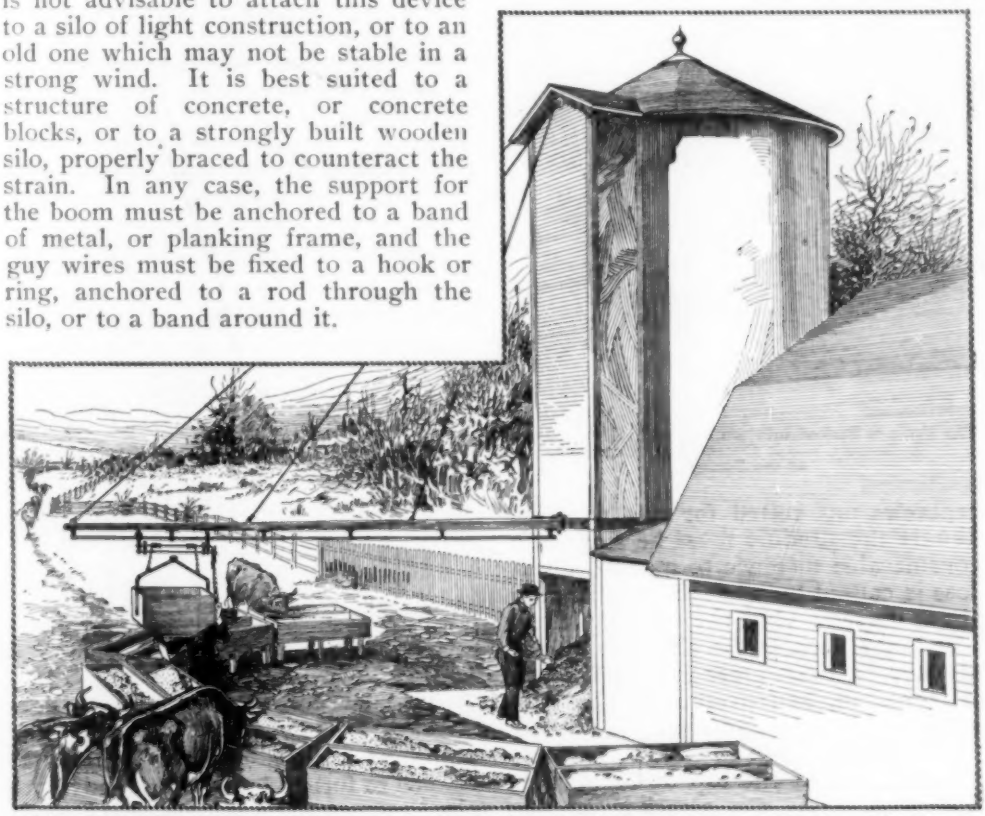


Barnyard Crane and Trolley for Silage Feeding

By F. H. SWEET

THE rapid and economical handling of silage with a minimum of manual labor often presents a serious problem where a considerable number of cattle are to be fed. The crane and trolley carrier shown in the illustration was installed to overcome these difficulties, and has been found satisfactory. The boom is guyed to the silo, which is reinforced to care for the additional strain, and has a radius of 20 ft. It is not advisable to attach this device to a silo of light construction, or to an old one which may not be stable in a strong wind. It is best suited to a structure of concrete, or concrete blocks, or to a strongly built wooden silo, properly braced to counteract the strain. In any case, the support for the boom must be anchored to a band of metal, or planking frame, and the guy wires must be fixed to a hook or ring, anchored to a rod through the silo, or to a band around it.

The boom is of wood, tapered from 6 in. at the hinged end to 4 in. at the tip. The hinged end is provided with metal fittings to permit free action in moving horizontally, and bolted so that the boom may be removed readily, when desired. A trolley way of band iron is supported from the lower side of the boom by metal braces. A carrier, having a drop bottom and an adjustable chain hoist, rides on the

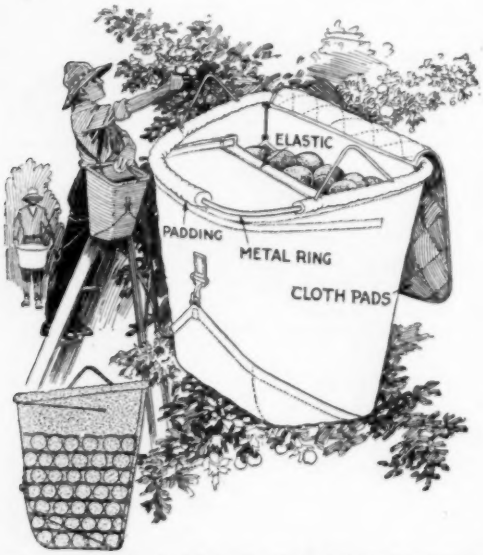


Silage is Handled Rapidly and Economically with a Minimum of Manual Labor by the Use of the Crane and Trolley Arrangement

trolley way, and conveys the silage from the chute to the cattle troughs. The latter are arranged in a double semicircle, so as to be readily supplied from the crane and carrier. The cattle feed from only one side of each trough, and are disposed radially in relation to the boom. The silage is thrown down the chutes to a concrete floor, from which it may be pitched into the carrier readily. The device may be rigged to be operated by one man, if the carrier is provided with an automatic trip operated by a rope from the chute. The cattle should not be admitted to the feeding lot until the troughs are filled, if convenient. It would be desirable, also, to provide a good footing for the cattle around the troughs, and if the continued use of the troughs warranted it, concrete areas might be provided.

Fruit Picker's Bag Minimizes Damage to Product

Fruit is often damaged by carelessness in picking, or by the use of receptacles not suited for this purpose. Where the product must be shipped a considerable distance to market, much loss is caused by what appears as only slight damage when the fruit is picked. The bag shown in the sketch provides a convenient container for the fruit as it is picked, and overcomes the possibility of serious damage.



The Fruit is Packed into the Bag with Slight Chance of Damage, and is Conveniently Removed at the Bottom

The bag is made of canvas, and has a metal ring at the top to support it. V-shaped loops are attached to the ring and from these the bag is suspended, on the shoulder of the fruit picker, by straps. The fruit is dropped into the bag and upon a guard of canvas having an elastic band at its inner edge. This breaks the fall of the fruit when dropped into the bag. At the back of the wire frame is a series of cloth pads which slide on the wire corner supports at the back. As each layer is placed in the bag, one of these cloths is placed over it as a protection. The bag is emptied at the bottom by opening the flap, which is fastened by a snap buckle.—H. F. Rundell, Chicago, Ill.

Improving Commutator Contact at Brushes

Commutators on motors, or small generators, particularly automobile generators, wear down, leaving the mica insulation strips exposed. The brushes will not make good contact, decreasing the efficiency of the motor, or in the case of the generator, will not permit it to operate properly. A tool convenient in remedying this trouble is shown in the sketch. It was made from an old hacksaw blade, about 8 in. long. One of the ends was ground to a point, as shown, and the other was shaped to form a hook. Both ends have chisel edges. The middle of the blade was wrapped with a piece of thin sheet

This Tool was Made from an Old Hacksaw Blade and Is Useful in Reducing Mica on Commutators

metal and electric tape. The mica is removed by the use of the sharp end of the blade, which produces a V-shaped groove in the mica. The hook end is used to finish the scraping. A small magnifying glass is useful in examining the commutator to make sure that the mica has been cut down properly.—J. C. Grindell, St. Louis, Mo.

Kinks in the Use of Tire Patches

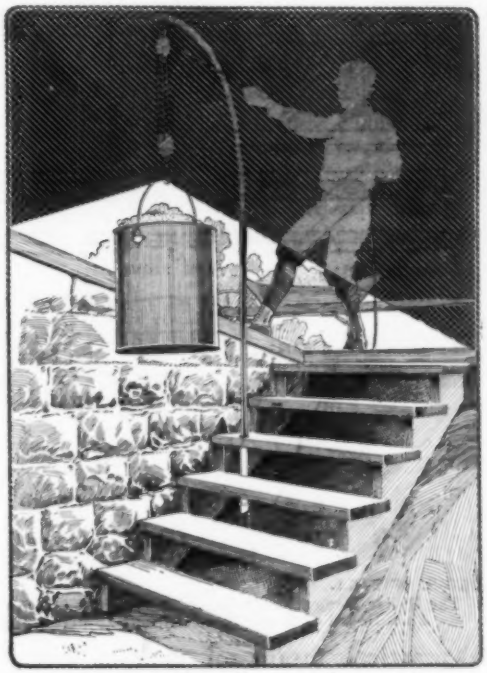
"Hook-on" tire patches hold rim-cut blow-outs well. They fit outside the shoe, and hook with metal fingers under the rim on both sides, except on straight-side tires. An ordinary inside blow-out patch will hold tread blow-outs, but is not satisfactory for rim cuts. Self-vulcanizing inner-tube patches are effective only when carefully applied. Follow the maker's directions closely. Gasoline should be "dribbled" on the patch from 30 seconds to two minutes before application; if any portion of the patch then fails to stick, lift the edge at that point and brush lightly with a gasoline-dampened rag; then knead into place. The necessity of kneading and pounding the patch into perfect contact must not be overlooked. Properly applied, these patches often outlast the tube.

Hastening the Settling of a Ground Fill

When ditches, or similar excavations, are filled the surface of the ground is often made irregular, because the earth does not settle properly; or if filled level, a trench may result when the earth settles. In lawns, or other places where it is desired to cover the surface quickly with sod, this is particularly objectionable. If the fill is built up to form a slight ridge, and the crest of it hollowed into a shallow trench, the rain water will remain in it, causing the fill to settle quickly and evenly. Lawn, a pavement or walk built over it will thus be more secure, and not liable to the danger of settling.—John V. Loeffler, Evansville, Ind.

Block-and-Tackle Hoist for Cellar

Removal of ashes, or other heavy material, from a cellar is often difficult; the device shown in the sketch



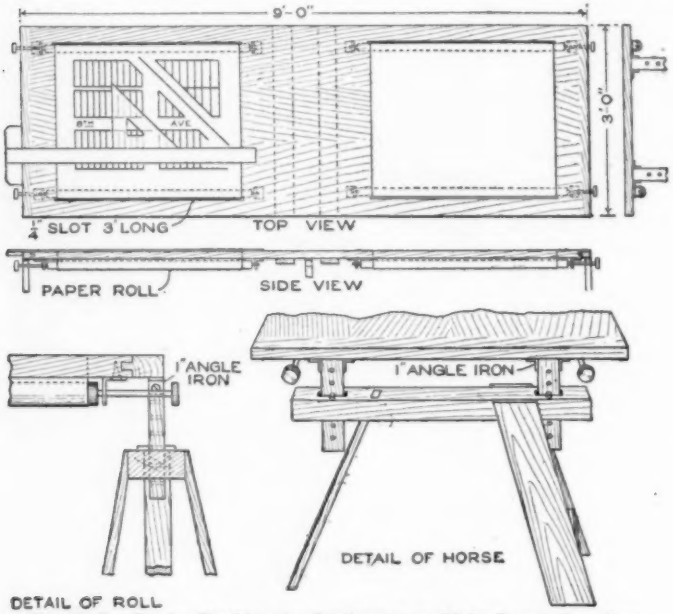
Ashes or Other Material may be Removed from a Cellar Conveniently with the Device Shown

was installed to facilitate such work. A davit, or curved standard, to support the block and tackle used, was fitted into the stairs, with the upper portion projecting out of the cellar door. The support is made of a 2-in. pipe, fitted at its upper end with a clevis to which the pulley is attached. At its lower end it is set into a larger pipe, which is bolted to the stairs. This arrangement enables the operator to load the bucket in the cellar, raise it by means of the block and tackle, and revolve the load on the standard for convenient dumping into a wheelbarrow.

The standard may be arranged so that its upper portion slides down into the supporting pipe, when not in use. It may thus be inclosed in the cellar, making it unnecessary to remove the tackle.—Stephen Bona, Union City, Connecticut.

Drafting Table for Full-Size Detailing and Large Drawings

A drafting table, simple in construction and which affords the draftsman a practical means of making large drawings, without soiling or injuring them in process, is shown in the illustration. It is designed for use by two draftsmen working on opposite sides of the board, and may be used by one man, who may have occasion to make two related drawings that can be handled more conveniently in this way. The paper is fed from a roll under the table top, and is rolled up on the opposite roller as the drawing progresses. The top is braced with angle iron and rests upon three adjustable supports. The dimensions given are suggestive only. The slots through which the paper passes may be made of any convenient length, and 3 ft. will be found satisfactory as a maximum. Their edges are rounded to protect the paper.



The Roller Device Enables the Draftsman to Make Large Drawings, on a Board of Small Size, without Injuring Them in Process

The rollers are supported on iron rods, on the ends of which are thumb wheels to make adjustment convenient. A satisfactory tension on the paper may be obtained by the use of plain rollers fitted carefully, and kept snugly rolled up. Rollers having pawl devices, like those on ordinary curtain rollers, may be used if proper allowance is made for winding off the paper when it is desired to remove the drawings. The horses which support the top are made with three legs, spread considerably so as to give stability on an uneven floor. The height of the table may be adjusted to suit the individual users by setting the pins in the vertical end pieces provided with holes. Sufficient play is permitted in these parts so that one person using the double table may tilt the top. The same general construction may be applied to a single table and in that case the tilting feature may be made more pronounced. When it is desired to make full-size details, or other very large drawings, in which a greater area of paper must be exposed at one time, the roller device may be fitted to the ends of the drafting table. It would be better in such cases to add a strip at the ends to provide for the slot, through which the paper is drawn, rather than cut a slot through the top of the table.—J. E. Cahill, New York, N. Y.

Sound Deadener for Fan Ducts

Small fans running at high speeds often vibrate considerably, and the vibrations are conducted to the ducts, causing a disagreeable roaring throughout the ventilating system. If the connection of the fan to the duct is made with a cloth sleeve, so that there is no direct contact of the metal parts, the noise will be eliminated. Canvas is suitable and may be made air-tight by painting it.

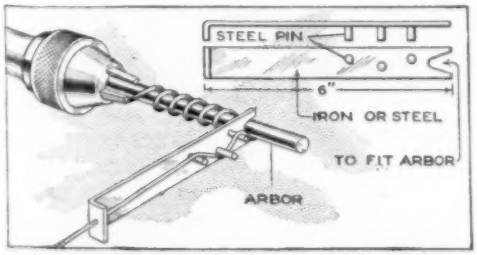
Gilding Old Frames

The fault with much of the gilding of old picture or mirror frames done at home is that the surface tarnishes rapidly. Two coats of gilt should be applied, each coat being permitted to dry thoroughly. Placing the frame in a warm place aids in the drying. Apply two coats of a good quality of varnish to the gilded surface, each coat being dried carefully, using a light stroke without laps.—Ralph W. Tillotson, Erie, Pa.

Winding Small Compression Springs

Having to make a number of open-coil compression springs of small music wire, a plain speed lathe being the only machine available, the problem was to wind the wire on an arbor uniformly, and with the desired space between the coils. After several tests, the device shown in the sketch was made in a few minutes, from scrap material. It proved satisfactory, the work being uniform and of even tension. The springs were wound several inches in length, and cut off as desired.

A round rod was used for the arbor, and was clamped in the lathe chuck. A steel tool, having a notched end and fitted with three steel pins, was made to fit the wire and the arbor. One end of the wire was fastened to the chuck and the other fed through the hole in the guide and over the pins, as the arbor was revolved in the lathe. The

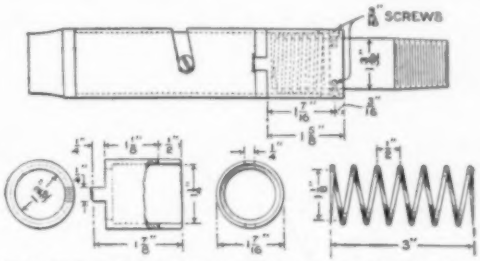


Springs of Uniform Pitch and Tension may be Wound Quickly in a Lathe with This Device

small pins give the wire the necessary tension, and must be located according to the thickness of the wire.—Charles F. Merrill, Hopedale, Mass.

Safety Throttle for Air Motors

Several accidents occurred in a shop from the unintentional starting of air motors, by jarring them or brushing



This Safety Throttle Prevents the Accidental Starting of Air Motors, by Securing the Throttle

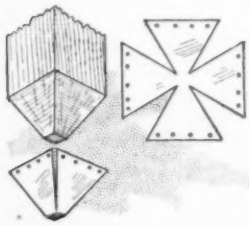
them aside with the foot. The safety throttle shown in the sketch was devised to prevent such accidents. The throttle is opened ordinarily by turning the sleeve. The bushing, 1⅝ in. long, has a projection in which a number of small teeth are filed, to engage similar ones in the end of the sleeve. A spring, made of No. 16 wire, forces the bushing into contact with the sleeve at the teeth. In this engaged position the motor is shut off. To start it the operator must move the bushing to disengage the teeth, after which the throttle sleeve may be moved freely. In shutting it off the teeth are again engaged. The bushing is fastened by two 3/16-in. screws, fitted in slots, so that it may be moved without releasing it completely. A ring is fitted between the spring and the screws, as indicated at the right end of the spring in the upper sketch.

Testing through Insulation on Wires

It is sometimes necessary to test for open or short circuits, and, especially in armature or field testing, it is essential that the insulation remain perfect. A satisfactory method of testing without breaking the insulation is as follows: Solder a needle to each end of the testing wires and force the needles through the insulation until a contact is made. The test may then be carried on in the usual manner.

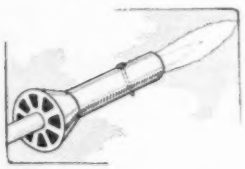
Metal Points for Fence Posts

Posts, fitted with metal points like that shown in the sketch, may be driven into the ground more readily, and will last longer than those not so guarded. The guard may be made of ordinary tinned sheet metal, or galvanized iron, cut to the shape of a maltese cross, as shown at the right in the sketch. Small holes are punched at its extreme edges, and the piece is folded to fit the end of the post and nailed into place. Similar pieces may be fitted to the tops of posts as a weather protection.—George H. Holden, Chesterfield, England.



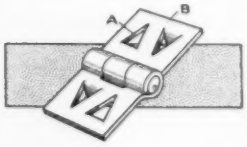
Silencing a Noisy Gas Burner

The type of gas burner that consists merely of a small pipe entering a larger one where the air is mixed, often gives out a roaring noise when turned on strongly. To stop this noise, drill a small hole through both sides of the larger pipe near the flame end and insert a nail. This simple expedient effectually quiets the burner.



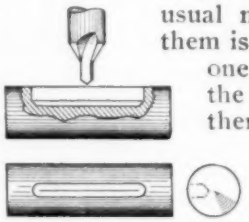
Hinge for Light Box

Hinges to be fixed into place with screws are often unsatisfactory for applying to light boxes. The hinge shown in the sketch was designed for use in such cases, and is inexpensive and can be quickly applied. No screws are required and the leaves of the hinge B are perforated with triangular holes. The portions cut out, as at A, are bent back and driven into the wood. They are set so that when driven in they tend to clamp against the strip of wood between them, making a secure fastening.—Charles Homewood, New Brunswick, N. J.



Milling Small Slots with Combination Center Drill

Elongated small slots must frequently be machined into constructions in the machine shop. A usual method of making them is to drill two holes, one at each end of the proposed slot, and then mill the intervening stock out by the use of a small milling cutter. A method which has been found more rapid and convenient is to use a combination center drill and countersink as a milling cutter. Drill holes, as shown in the sketch, at each end of the slot. Then set the countersink to a slight depth and mill a groove the length of the slot. Repeat this in gradual cuts until the slot is of the required depth. The work is held in the milling-machine vise, and the drill in the vertical milling attachment.—George P. Breitschmid, Arlington, R. I.



End Guards for Plug Gauge

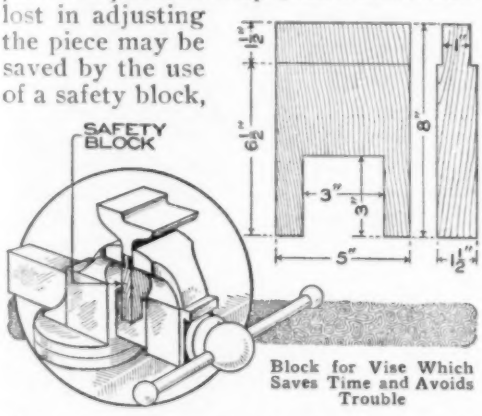
Plug gauges, like that shown in the illustration, are usually made to very close dimensions and nicking or otherwise injuring the ends makes the gauge useless. In order to protect such a gauge while being used on the workbench or stored with other tools, end guards were made, and fitted into the ends as shown. The guards permit the gauge to rest on their edges so that the surface of the gauge does not come into contact with the bench or other resting place. They may be removed quickly when necessary.

Soldering Drilled Lug on Sheet Brass

In electrical work, and other mechanical fields, it is sometimes necessary to thread a thin piece of brass, or copper, and in order to have sufficient stock so that the thread will not strip, a nut must be soldered on as a reinforcement. After soldering on the nut the hole must be drilled in the sheet metal before the threads can be tapped. Time may be saved by providing a piece of sheet aluminum with an aluminum plug projecting from it. The latter may be made by cutting cross slots in the metal and bending up the resulting points. The aluminum plug, or stop, is fitted to the hole bored in the sheet metal. A flux is applied to the brass around the stop, and the nut is placed over it. The portion around the hole is then heated, and solder is applied. The nut will be soldered firmly and accurately over the hole, and the aluminum piece will not bind, as it cannot be soldered fast under the conditions.—W. T. Derr, Rochester, Ind.

Safety Block for a Bench Vise

In filing small pieces of material in a bench vise, or in attempting to hold pieces of peculiar shape, time otherwise lost in adjusting the piece may be saved by the use of a safety block,

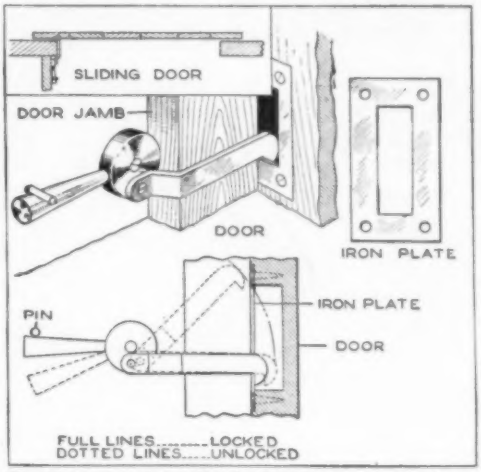


Block for Vise Which Saves Time and Avoids Trouble

shown in the sketch. It should be made of hard wood and the end grain should be at the shorter edge, so that the heavy wear will be taken at that point. Straight-grained stock is best for this purpose.

Eccentric Catch for Sliding Barn Doors

A blacksmith fashioned the door catch shown in the sketch to secure a heavy sliding door on the outside of



The Eccentric Catch Holds the Sliding Door Firmly and Prevents Outward as Well as Sidewise Movement

his shop, without the use of a device requiring a key. An iron plate, with an oblong opening in the middle, was fitted to the door so that the plate would be at the door jamb when closed, as shown in the inset plan. A hook was pivoted near the edge of an iron disk, which was fitted with a handle. To engage the catch in the plate the hook is lowered and the handle is turned down to give the necessary freedom of action. The handle is then raised to the pin, which acts as a stop, and the eccentric action secures the hook. To release it the handle is lowered and the hook raised from the plate as indicated by the dotted lines.

Weights for Drying Large Pieces of Cloth

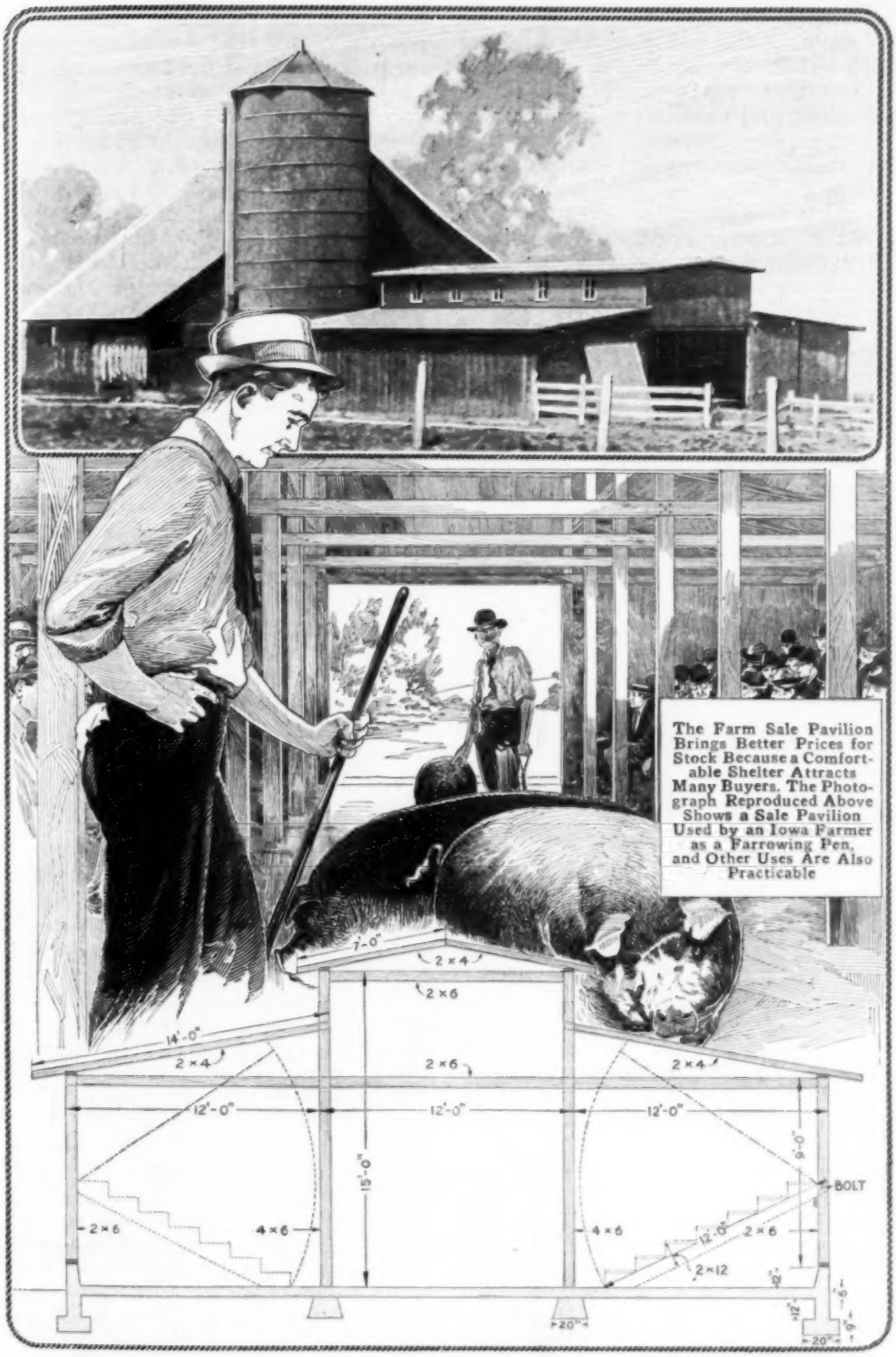
When a flag, or large piece of cloth, is hung out to dry on a windy day it often becomes entangled about the line. This may be overcome by fastening small weights, or wooden clasps, along the lower edge of the cloth. If wooden clasps are used, small cloth bags filled with sand should be suspended from them.—A. Fleck, Yonkers, N. Y.

A FARM structure that is desirable not only because of its primary use as a sale pavilion, but also by reason of its adaptability to a wide range of other uses, was built by an Iowa farmer, and is shown in the photograph reproduced in the illustration. It was designed for the sale of pure-bred hogs, but its convenient size makes it available for the sale of various kinds of farm animals. It was used as a farrowing pen when not needed for occasional sales, and gave thorough satisfaction. In regions where hog raising is not important enough to require a sale pavilion or a farrowing pen, the building may be used for housing other young farm animals, or for machinery and other storage purposes. It is 30 by 36 ft., with a clear space of 10 ft. from the concrete floor to the rafters. The seats for the spectators are arranged upon stringers, and built in sections. They are hinged on bolts set in the studding, and when the pavilion is not in use for sales purposes, the seats are raised and held at the roof rafters, as shown in the sectional diagram. The construction is light and standard, hence the expense of building such a structure is not great in proportion to the accommodations. A feature not to be overlooked is the better prices obtained for stock, because the pavilion, heated by salamanders, will attract many more buyers than would come to a sale held in the open, especially in cold weather.

The structure is supported upon a concrete foundation and provided with a concrete floor throughout. The latter is especially desirable, since it makes cleaning after use for purposes other than as a sale pavilion, quite convenient. The foundation is built as a unit with the floor, and has a footing ample to carry the load. The footing section of the foundation is 20 in. wide and 9 in. thick, a section of the same thickness supporting the floor and tapering to a width of 7 in. where the studding rests, 1 ft. above the floor, as indicated in the sectional diagram. The foundations for the main supporting posts have a footing of 20 in. and are 12 in. thick. The foundations are poured in wooden forms, and their lower portions may be poured into the excavation, if the ground is suitable and the excavation is carefully done. A mixture of 1 to 3 to 6—one part cement, three parts sand, and six parts crushed stone or gravel—is suitable for the making of the foundations and floor. The concrete work should be permitted to dry three days before removing the forms, and, if moistened occasionally for several days thereafter, will dry more uniformly. Bolts are set into the foundation at intervals so that the plate, on which the studding rests, may be fastened securely to it.

The roof is built with a raised portion along the ridge, provided with several windows to give light and good ventilation. At either end of the central driveway are sliding doors, making it convenient to take stock in and out. The framing is of light timber, built into simple squared frames. The central supports are of 4 by 6-in. stock, 15 ft. long. The studding in the sides is of 2 by 6-in. stock, 9 ft. long above the concrete foundation. The supports are set 12 ft. apart, as shown in the sectional diagram. The roof rafters are of 2 by 4-in. stock, and the horizontal rafters of 2 by 6-in. stuff.

The seats or "bleachers" are supported on stringers, 2 by 12 in., and 12 ft. long. They are built in sections pivoted on bolts through the studding, so that they may be raised to the roof rafters without interfering with the



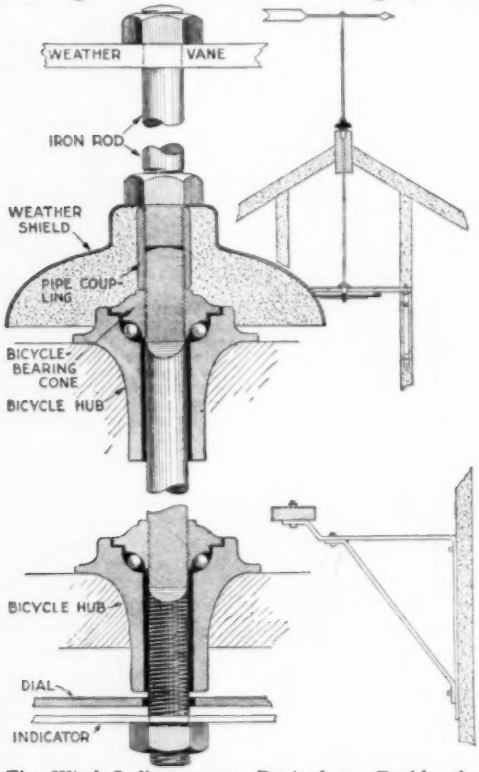
The Farm Sale Pavilion Brings Better Prices for Stock Because a Comfortable Shelter Attracts Many Buyers. The Photograph Reproduced Above Shows a Sale Pavilion Used by an Iowa Farmer as a Farrowing Pen, and Other Uses Are Also Practicable

horizontal rafters. The seat boards are of 7/8-in. stuff, and may be made of strips if thicker material is used.

The roofs are covered with rough boarding and surfaced with a composition roofing material. The sides of the building are finished with matched siding, and the raised section at the top is finished with the same stuff. The windows are of the common four-light type and may be purchased at local lumber yards or mill-supply houses.

Wind Indicator for Greenhouse

Difficulty was experienced by the gardener in a large greenhouse in regulating the ventilators at night, because he could not ascertain readily the direction of the wind. The wind indicator shown in the sketch was devised and proved satisfactory, as the direction of the wind is shown on a dial in the greenhouse, so that any change in the wind may be observed promptly, and the necessary adjustments made. The device was made of an old bicycle hub, as a bearing for the vertical rod and the dial arrangement, strips of iron for the brackets, and a rod for the vane support.



The Wind Indicator was Devised to Enable the Gardener to Note Changes in Wind Promptly and Regulate the Greenhouse Ventilators Accordingly

The bicycle hub was cut at the middle, and one section used for the upper bearing and the other for the lower one. A rod was fitted between the bearings, as shown in the sectional view, and extended at its lower end to provide a threaded seat for the indicator in the greenhouse. A pipe coupling was fitted to the upper end of the rod, immediately above the upper bearing, and a similar section of rod screwed into it, to give a support for the weather vane, which is held in place by a nut. The upper bearing is fitted into the ridgepole, through which the vane support projects, and is protected by a weather shield, as shown in the sectional view. The lower bearing is supported in a wooden piece carried on two brackets, shown in the views at the right of the sketch. The dial is supported on the lower side of the wooden piece resting on the brackets.—Nicholas Gerten, Urbana, Ill.

Holding a Small, Irregular Piece in a Vise

Small pieces of material, which are difficult to hold in a vise or other clamp, should be fastened to a small block having its sides parallel, and then clamped into position. If there are no holes through the piece, which may be of wood or metal, the screws may be placed along the edges to act as clamps.

Translucent Window Covering

Repeated coats of raw or boiled linseed oil applied to a finely meshed wire fabric will give a good substitute for window glass. The wire may be used for many purposes, and is especially good where glass might easily be broken. The fabric may be dipped in the oil instead of applying it with a brush.

Obtaining Long Wear Out of Piston Rings

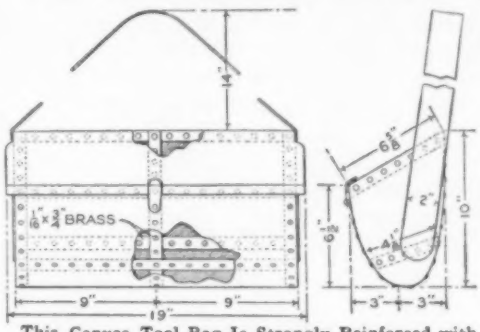
The cylinder in my gas engine became badly worn so that new piston rings would not hold for perfect compression. I observed that my worn-out piston rings were about one-half the thickness of the ring groove, so with a hacksaw I cut a portion out of one ring so that, when it was placed inside of another and squeezed together, the ends would almost meet. I placed a set of these double rings in my engine, and the result was very satisfactory. The rings were used until worn very thin, and gave about three times as much wear as when I used single rings. The openings in the rings should be placed on opposite sides of the cylinder.—W. M. Hohner, Lowgap, Washington.

Sprocket Made of Wooden Disk and Staples

Sprocket wheels for experimental work or other constructions, where strength is not a large factor, may be made by fixing staples around the circumference of a round wooden disk of suitable diameter. Link chain of the ordinary variety as well as the sprocket-wheel type may be operated on such a sprocket if the staples are set properly. In order to determine the points at which they should be placed the chain must be fitted around the circumference of the disk and the staples inserted and driven at the proper points.

Canvas Tool Bag

Electricians, carpenters, automobile-repair men, and other mechanics, will find the tool bag shown in the sketch convenient, although it was designed for use by car inspectors in railway service. The frame is made of 1/16 by 3/4-in. brass, or galvanized-iron, strips, covered with 10-oz. canvas, and supported by a 2-in. leather shoulder strap. The frame is reinforced across the ends by similar metal strips, and No. 12 copper rivets are used in fastening the material throughout. The cover is kept in place by a buttoned strap, and

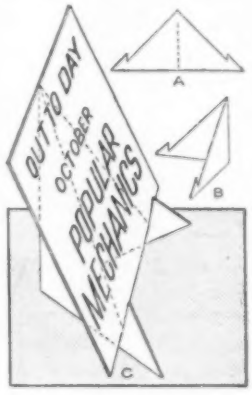


This Canvas Tool Bag Is Strongly Reinforced with Metal Strips and Is Useful for Mechanics Who Carry Small Tools

extends ½ in. beyond the ends of the bag at the portion below the fastenings of the shoulder strap. The shape has been found convenient for the special purpose for which the bag was designed, but this may be readily adapted to the carrying of special tools, or even material.—Joseph K. Long, Renovo, Pennsylvania.

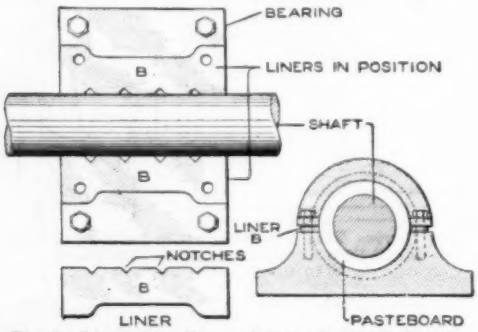
Convenient Show-Card Holder

A holder for show cards, or other purposes where a small stand or easel is required, may be made from a piece of cardboard, cut and folded as shown in the illustration. A section of cardboard of a suitable color is cut to the shape shown at A, and the dotted line indicated upon it. By folding the piece on the dotted line, as at B, two supports are provided, and the card or other article may be set in the two small notches at the front of the device, as indicated at C. The holder has the advantages that it may be made quickly and is quite inexpensive.



Babbitting Split Bearings in One Operation

When the bearings of machines become worn so badly that rebabbitting is necessary, the work may be done in one operation, instead of babbitting the



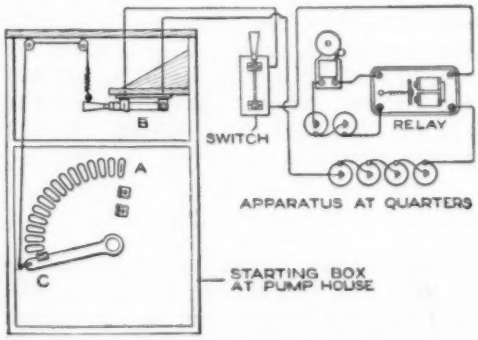
Fit the Liners into Place, Center the Shaft, Put On the End Rings, and Pour the Babbitt into the Bearing

halves separately. No extra labor or equipment is required, and the process is simple. The illustration shows the bearing with the upper section removed, and at the right, an end view of the bearing with the cardboard rings in place for the pouring of the metal. A liner, or packing, of leather, or sheet metal, is also shown. It is placed between the halves of the bearing to provide the necessary space for taking up the wear in the bearing.

First, two liners, B, are cut to fit the bearing and fitted between the halves of it, as shown in the end view. The small notches are necessary so that the metal may flow from one half of the bearing to the other. The shaft around which the babbitt is poured must be centered carefully, and two small pieces of wood or leather are placed in the bottom half of the bearing to hold the shaft in position. Cardboard rings are fitted around the ends of the bearing, as shown in the end view, and, if necessary, clay may be packed around the end of the bearing to prevent leakage. When the metal has been poured and permitted to cool, the halves of the bearing may be separated with a hammer and cold chisel. If the work is carefully done, little dressing will be necessary around the edges.

Trouble Signal for Motor-Starting Rheostat

A pump furnishing water to a small city is situated about one-half mile from the power-plant engine room, and on various occasions, particularly at night, it stopped suddenly. The man on watch was unable to observe promptly that the pump had stopped operation. For this reason the device shown in the sketch was installed, and gave thorough satisfaction, making it unnecessary for the watchman to remain in close proximity to the electrical switch, which controlled the power at the rheostat. Batteries, a relay, and a single-pole knife switch were installed at the watchman's quarters, arranged as shown at the right. The arm of the rheostat is at the position A when under extreme load; at C when the current is shut off, and at intermediate points when the current varies. A wire, with a spring attached, was fixed to the arm at C and conducted over pulleys to the switch B. When the power is started, the arm is brought to A, and the switch B is opened. The switch at quarters is normally closed. When the arm drops to position C the switch B is closed, completing the circuit, and causing the bell to ring. The watchman stops the ringing by drawing out the switch at quarters and goes to the power room to attend to the rheostat, and to open the switch B for further use.—A. P. Sitton, Fort Stanton, N. M.



When the Arm of the Rheostat Falls the Bell Circuit is Closed, Warning the Watchman

The Woman's Home Workshop

By Avis Gordon Vestal

PART I—Designing the Kitchen for Comfort and Convenience

[This is the first of three articles, in which Mrs. Vestal, "domestic engineer," sets forth the mechanics of the kitchen, illustrating fundamental design and details with practical examples. Each installment is complete in itself, but will be more fully appreciated in connection with the others.—Editor.]

PRINCIPLES of mechanical efficiency, applied successfully to the design and equipment of factories, stores, and offices by men, are capable of application to the domestic workshops of their women-folks. Only seven per cent of the families of the United States employ one or more regular domestic helpers. The ninety-odd housekeepers remaining out of every hundred, must do their own work, with only such help as their children or an occasional hired laundress or scrub woman can give. The difficulty of securing servants, even inefficient ones, and the high wages, board, and breakage are urgent factors at present demanding the building of kitchens of the labor-saving type. The many outside demands now made upon the time and energy of wives and mothers also force women to think, as never before, of means to "cut the work out of housework."

Kitchens are changing rapidly from general-utility rooms, as used by our grandmothers for all the industries of the home, to specialized workshops, smaller in size, more compactly arranged, and equipped with modern conveniences. Washing and ironing are usually banished to a basement laundry, and sewing and dining are commonly moved toward the front of the house. The kitchen of many city apartments now provides only for cooking and dishwashing. The suburban, or small-town, house is likely to need some provision for young children. The farm kitchen frequently must retain dairy work.

We cannot hope, nor do we wish, to standardize kitchens as completely as factories are. They must remain individual in many respects, yet there are certain general principles of design in the room, of choice and grouping of built-in and portable equipment, that all of us can use, modifying details to suit our purses and our personal needs.

A kitchen should be large enough to house necessary furnishings, yet small enough to save miles of needless walking every week. It should be adequately heated in winter but reasonably cool in summer. Ventilation must not be neglected. Floors and walls should be easy to clean. Colors should be cheerful and harmonious. Good artificial lighting for nights and cloudy days must not be forgotten. The climate and the direction of prevailing summer breezes are other determining factors in the design of a woman's workshop.

Inside of the room we should observe this fundamental principle: Things used for a common purpose should be grouped as nearly as possible together. A second rule, formulated by an authority after extensive tests, is that the height of all working surfaces, at which a woman stands, should be in a definite relation to her own height. A woman of average height, 5 ft. 4 in., requires a table, iron-

ing board, or sink bottom 30 in. above the floor. For every inch she is shorter or taller than that, she should subtract or add half an inch.

Doors in a kitchen should be as few as possible, for they consume much usable wall space when closed, and twice that amount when open. They are usually best placed near corners, for doors or windows in the middle of walls tend to separate equipment which should be kept close together. If possible, make the path through the room along one side, not diagonally through it, that other members of the family, passing through, may not interfere with the cook.

Windows are well placed higher in the walls than in other rooms, and for two reasons. The space beneath a high window may be used for placing furniture, as a sink or table. Further, hot air rises to the top of the room, and, if at least one window rises to the top of the room, it can be lowered from the top for ventilation. Alternate arrangements for cooling the room and freeing it of cooking odors are the use of transoms, of hinged casement windows, or the installation of a hood above the range opening into the chimney.

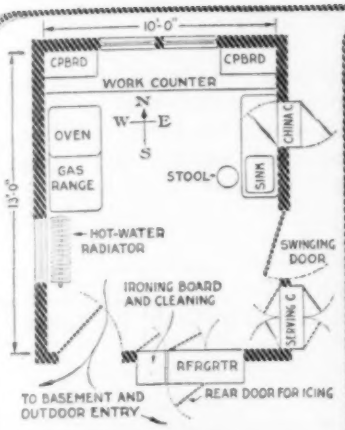
Floors should be smooth, hard, nonabsorbent of water and grease, and elastic to the step. If tile, or composition flooring, is used, provide rubber mats to stand upon, in front of the stove and the cabinet. A rounded, or cove, base and rounded corners are easier to clean thoroughly, with either broom or wet mop.

Several specific kitchens embodying many of the principles of mechanical efficiency will be of interest. They are shown in plan and in detail in the full-page illustration. The kitchen in the home of a member of a college faculty, shown in the upper views, is of medium size, 10 by 13 ft., compactly arranged for cooking and its related industries. Washing and ironing are banished to the laundry. Two north windows light the work counter, beneath and above which are cupboards, drawers, and bins for all the supplies, utensils, and tools, everything needed for cooking, save foods in the refrigerator, being within arm's reach. Enameled steel gives a smooth, sanitary surface to the table part. Running the width of the room, it provides generous space for food preparation, in efficient contrast to the single small table used in many kitchens. The windows are set high enough to permit use of the wall between them and the counter. The window ledge holds scales and alarm clock. A narrow shelf beneath is devoted to spices in neat, covered containers. Below this are hooks for cooking utensils and small implements, in frequent use. The two cupboards flanking the windows reach from a foot above the counter quite to the ceiling, leaving no top to collect dust. Racks inside the doors hold lids and flat pans. Beneath the counter are tilting flour bins and an unusual double-door compartment, into which the fireless cooker is rolled.

The gas range is at the west wall, just a step from the cook's counter. The special point of merit in its selection is the cabinet form with high oven at one side. This saves stooping. Beyond the range is the radiator under the west window.

Coming next, in our tour around the room, is the south door leading to the basement and out of doors. Built-in storage, of much interest, occupies the rest of the south wall. The narrow door discloses table leaves and cleaning equipment. What appears to be a wide, high cupboard is a refrigerator set with its front flush with the wall, raised to save stooping, and filled from the rear. Barring out the iceman, with his muddy shoes—the welcome block of dripping coolness notwithstanding—saves much cleaning of the floor.

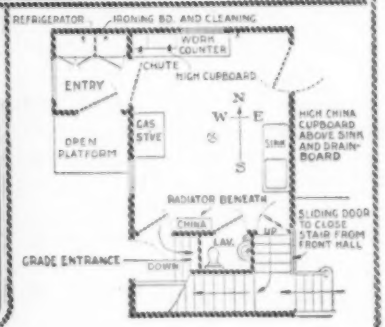
The east wall is given over to food service and dishwashing. First is a cleverly designed serving cupboard, opening into both kitchen and dining room, and invaluable to one serving a course dinner without a maid. The first hot courses can be put through the lower counter; salad and dessert can be prepared in advance and set upon the shelves above. Each course, as re-



View to the North Wall, Showing the Gas Range, Cupboards, Work Counter, and Sink

Above: Plan and Detail View of a Compact Kitchen in the Home of a College Professor. The View Shows the Southeast Corner

Below: Interior Views and Plan of the Kitchen in a Physician's Home. View into the Southeast Corner, and, at the Right, View of the Northwest Corner



PHOTOS, COURTESY OF IOWA STATE COLLEGE

The Kitchen Layouts Shown in the Plans were Designed to Afford the Greatest Convenience in a Small Area, the Cupboards, and Other Equipment, being So Disposed as to Reduce Necessary Walking to a Minimum

moved, goes back to the waiting cupboard. The dining-room door has a glass panel to avoid awkward collisions, so frequent when persons approach the door from the two sides, each unaware of the other.

The dishwashing group utilizes the remaining space on the east wall, and is closely related to three positions. It has a china closet above, into which dishes are set as cleansed, without moving a step. They are ready then for removal from the dining-room side. The sink is also in close proximity to the work counter, making it easy to draw water for food preparation, and to place soiled mixing dishes to soak. The distance to the stove is also not great.

The upper walls are of rough plaster, the lower being smooth cement plaster, marked into bricks. The woodwork is pine finished in white enamel, easy to wash. The tile floor slopes to a drain under the sink; it can be flushed with water and dried with a rubber window brush, on a long handle.

In a small city in Iowa, I had the pleasure of visiting a delightful kitchen in a doctor's residence, the plan and details of which are shown in the lower part of the full-page illustration. It has the same dimensions and same north-and-west exposure as the first kitchen, but has only one window at the north. The light walls, rough plaster above and plain cement below, and the deep-cream enameled woodwork reflect all the sunshine that enters the room. Many a woman could transform a gloomy workroom by changing its dark-green painted walls, or its brown-papered ones, for some warm color, as cream, yellow, or tan, which reflects light instead of absorbing it. The floor is of varnished hard wood.

The built-in cabinet, under the north window, is of correct height for the doctor's wife, is finished in cream enamel, with glass knobs, and has a tilting bin, cupboards, drawers, and bread boards beneath. Through one corner of the high cupboard runs the clothes chute, with an opening into the kitchen.

On the west, the outer door opens upon an entry, which holds the refrigerator, and a closet for an ironing board, outdoor wraps, and cleaning equipment. A door stop keeps it from striking the gas range when opened. It would be convenient to have a narrow shelf upon the wall above the range, to hold fresh and spent matches, and salt and seasonings of frequent use in cooking.

Along the south wall is shown a door leading to the basement, and to a grade-level outside door; then the radiator, with a china cupboard above; next, a convenient closet beneath the stairs, housing a toilet, lavatory, mirror, and clothes hooks, and finally, a short branch of the one central stairway, the second step being hinged to open up a cubby-hole, providing for the dish drainer and unsightly utensils, not often used.

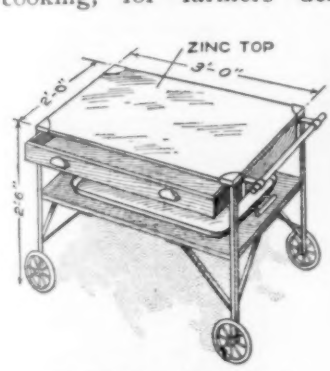
On the east wall is the sink, with china closets above, closed by sliding doors. A stepladder stool is provided as a seat for working, and for use in reaching high shelves in the cupboards. The electric light is on a drop cord from the center of the ceiling, but a hook over the range holds it when desired. A second light is in the lavatory and there is a wall outlet for the electric iron.

The problems of the isolated country house are somewhat different. Usually cooking must be done for a larger family and more transients. Distance from markets makes more storage place for staple groceries necessary. Lacking city utilities, ready to be piped or wired in, the farmhouse cannot be labor-saving in its kitchen arrangement unless individual installations of water, pump, sewer, and lights are arranged. The third workshop is one I designed for a new farmhouse, and is shown in plan and detail, in the inset illustrations. There are no young children to consider, but there are three in school, and a grown daughter who assists her mother with the work. There are, also, hired men to be boarded during special seasons.

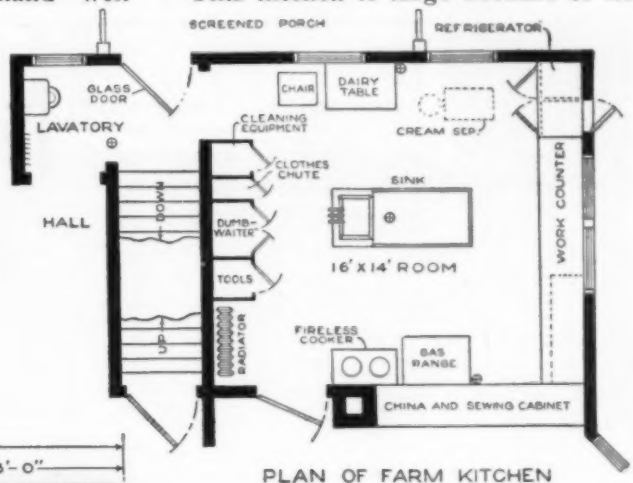
The kitchen will have running hot

and cold soft water for cleansing purposes, and hard water for drinking and cooking, for farmers demand well water for drinking, no matter how carefully the cistern water is filtered. In winter the water is heated by furnace, in summer by a gas heater in the cemented basement, where the hot-water tank is located. The need of much hot water, all the year round, is very great in the farm home, and the mother and daughter will be saved carrying in tons of water every year, thus being relieved of one of the heaviest burdens of the old-fashioned farmhouse. Several types of gas plants are giving excellent service in rural homes, among them gasoline and acetylene. The gas plant of this farm will "kill several birds with one stone"; it will light the house, heat the water, cook the food, and iron the clothes.

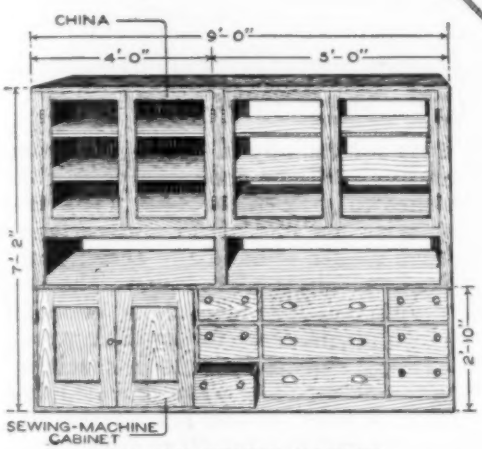
This kitchen is large because of its varied industries, its storage space, and the fact that two women work in it. The mother thought she could not get along without a coal range, for she has always had one. I have told her that coal overheats the kitchen in winter, since she has a furnace. It throws waste heat into the room and "cooks the cook" in summer. The basement gas heater will do away with the need of the coal range to warm water. To please her, however, the chimney is so located that if she pines for the old range she will have a place to put it. The gas range she has ordered is as convenient as any city housewife's, with its four open burners, simmerer,



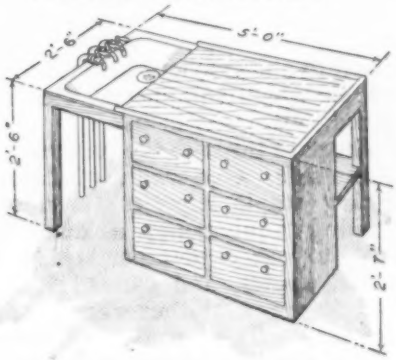
WHEELED DAIRY TABLE



PLAN OF FARM KITCHEN



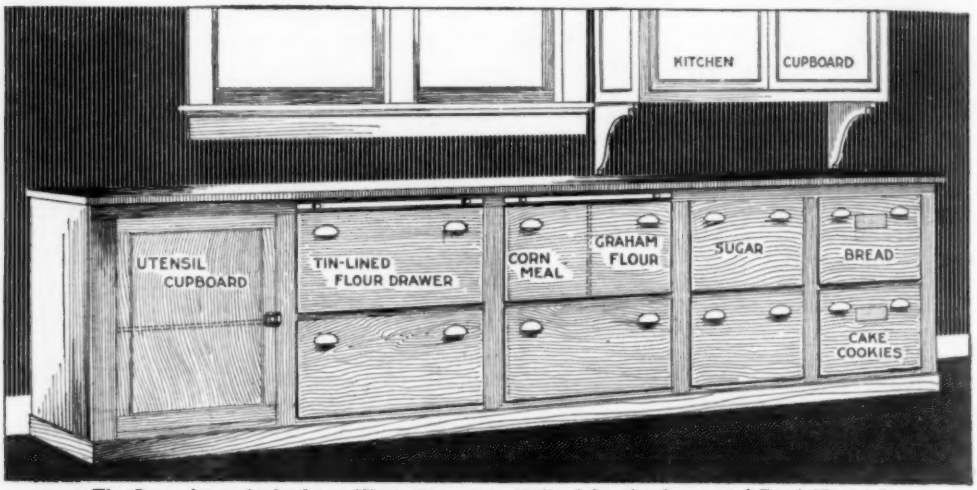
CHINA AND SEWING CABINET



SINK AND DISHWASHING TABLE

The Farm Kitchen is Designed to Provide Adequate Space for the Varied Work to be Done, and to Enable Two Persons to Work in It without Hindering Each Other. The Centrally Located Sink Is a Distinctive Feature

high oven, and broiler. The floor space saved by the narrow stove is given to a two-compartment fireless cooker, frigerator and staple foods in the long cabinet are mixed with utensils close at hand. Next, to the right, is the



The Space beneath the Long Work Counter is Utilized for the Storage of Food Materials and Other Articles Used on the Counter

raised to a convenient height by a cabinet, in which the special utensils are stored, when not in use.

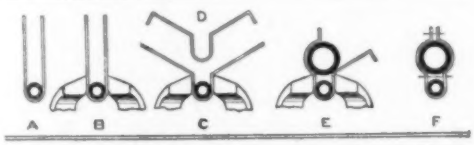
The path through the room is located at one side. One wall is given over to storing staple supplies; a closet for cleaning equipment; a dumb-waiter used to carry potatoes, other vegetables, apples, and canned fruits, up and down; a clothes chute, and the register. The same dumb-waiter brings up the heavy basket of wet clothes, washed in the basement laundry, ready to hang out in the sunshine.

The opposite wall, on the south, where the prevailing summer breezes may be enjoyed, is designed for cooking preparation. It has a long work counter, shown in detail in the sketch, with storage beneath, and a high cupboard at one end. The refrigerator is built into the wall and iced from the rear. The owner of the farm built his own ice house, and cuts ice every winter from a river a mile away, selling enough ice to his neighbors to compensate for his labor. In winter the outside icing door can be left open, and cool air will circulate and keep food nicely. The arrangement permits routing work from left to right in order, as performed. Food in the refrigerator and staple foods in the long cabinet are mixed with utensils close at hand. Next, to the right, is the stove for cooking it. Swinging around on her heel, the cook can place soiled dishes to soak in the sink. The proximity of one end of the counter to the stove makes it handy in serving up a meal, which is placed upon the open serving shelf of the china cupboard, which opens, also, to the dining room. The east side of the room is specialized as the dairy. There is a wheeled dairy table, shown at the left of the plan, and the cream separator. The daughter can attend to this work while her mother is cooking. When the work is finished, she rolls the table beside the sink and washes the buckets, pans, and separator parts.

A great convenience for the men, coming in dusty and sweaty from the fields, is the location of a lavatory, mirror, towels, and coat hooks off the rear entry. After cleaning up, they can go through the hall to the dining room, or reach the bedrooms easily. The use of this entry makes it possible to carry vegetables and fruits to the cellar for storage, without passing through the kitchen, and makes unnecessary the building of a second stair from the cellar to the outside of the house. It is also handy for removing furnace ashes.

Straps to Fit Double-Pipe Runs

In the course of my work I found it necessary to run a considerable length of ¾-in. conduit parallel with and closely adjoining a 1¼-in. pipe. The clamp shown in the illustration was found to be easily made and practical, in use as well as installation. The clamp is made as follows: A strip of 1/16-in. band iron, ¾ in. wide, is bent halfway round the smaller conduit, as shown at A. The successive stages of the forming of the clamp or strap are shown in the sketches B to F. The strap around the small conduit is clamped into a vise, as at B, and the ends are bent at right angles, to make the larger pipe the proper distance above the lower one, as at C. The ends of the strap are then shouldered, as at D, and bent around the larger pipe, as at E. The completed clamp is shown in a sectional view at F. The double run of pipe may now be suspended as a single unit. If desired, the clamps described may be made with



The Strip of Band Iron is Bent to the Proper Shape by Clamping It in a Vise and Forming It around the Conduits

shoulders at their upper ends so that they may be used to suspend the double run.—G. Raymond Flake, Lewistown, Pa.

Sulphate-of-Zinc Paint

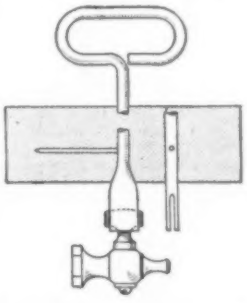
A paint which has been found efficient, using coal oil and water as a vehicle, is made as follows: Dissolve 18 oz. of sulphate of zinc in 1 gal. of distilled water, mixing thoroughly. Stir in 1 qt. more of distilled water, mixing carefully, and add ½ pt. of kerosene, or coal oil. Considerable stirring is necessary to effect a good mixture of the water and the paint, although this is aided by the chemical. —L. R. Kelly, Chicago, Ill.

Underground Brace for Gatepost

Gateposts sagged so as to make the gate ineffective are quite common, largely because of poor bracing. The method illustrated of bracing the posts underground is simple and substantial. It leaves the exit clear of surface braces and provides a rigid support for the gate even when the posts are sunk only 15 in. in the ground. A cross brace is housed into the gateposts at the surface, and another binds the posts at their lower ends. The joints should be spiked together strongly, and the portion underground should be tarred to prevent it from rotting quickly.—Frederick W. Brown, New York, N. Y.

Long Wrench for Automobile Drain Cocks

The necessity of crawling or reaching under automobiles in order to clean drain cocks may be obviated by the use of the long-handle wrench shown in the sketch. It was forged from a piece of ¼-in. round wrought iron, 2½ ft. long. One end was forged into a handle and the other was "upset" and slotted to fit the keys by which the drain cocks are opened.—H. W. Offins, Grants Pass, Ore.



Substitute for a Hanger Bolt

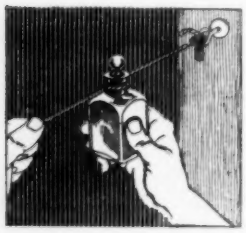
Hanger bolts which have a wood screw on one end and a machine screw on the other are not always carried in

Cutting Off the Head of a Wood Screw and Threading the End Provides a Hanger Bolt

stock by hardware dealers. When they cannot be obtained a substitute may be made by sawing off the head of a wood screw and cutting machine threads on this end.

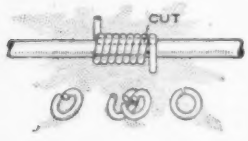
Loosening a Tight Glass Stopper

Heat generated by the friction of a cord drawn rapidly around the neck of a bottle, as shown in the sketch, will cause the glass to expand and free the stopper. A convenient method of accomplishing this is to tie one end of a cord to a hook in the wall, wind the cord around the neck of the bottle, and hold the other end of the cord as indicated. The bottle may then be drawn quickly back and forth along the cord, causing the neck to become heated.—James M. Kane, Doylestown, Pa.



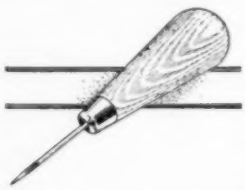
Making Small Wire Rings

Small wire rings may be made quickly by winding a wire around a rod slightly smaller than the diameter of the rings desired, and cutting the wire into sections. The wire is wound around the rod in a spiral, as though making a spring. A cut is made through the length of the spring, resulting in rings that are sprung open slightly. These may be closed neatly by tapping them upon a bench block, or clamping them in pliers. The sketch shows the method of winding and cutting the wire, as well as rings in process.



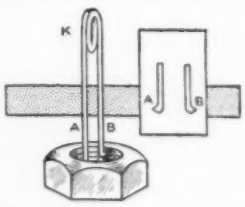
Lockstitch Sewing Awl

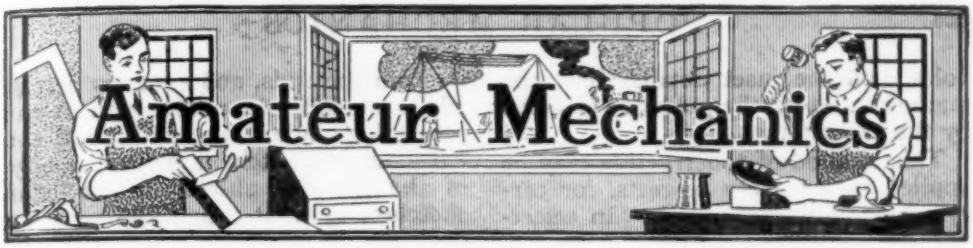
A satisfactory awl for sewing leather, or repairing harness, may be made by fitting a large-sized darning needle into a handle, as shown in the sketch. The handle should be of hard wood and provided with a ferrule. The eye of the needle should be of a fair size, and the exposed end should be ground to a sharp point. The awl is used by threading a waxed cord through the eye and driving the needle through the leather. One end of the cord is permitted to extend along the under side where the sewing is done, and the other is locked over it with each stroke of the needle. When the awl is withdrawn from the hole the thread passing through its eye is looped around the lower thread, forming a lockstitch.



Wire Spring Machine-Thread Cleaner

Accumulation of dirt and metal chips in machine threads causes much annoyance when threaded parts are to be fitted together quickly and firmly. The illustration shows a simple device made of a wire spring with which such obstructions may be removed from the thread. The spring is coiled at its center as indicated at K; the ends are flattened to a chisel edge and ground to points, as at A and B. The points are inserted in the thread, and the spring action holds them in place while they are scraped through the threads.—George L. Yaste, Lonaconing, Md.

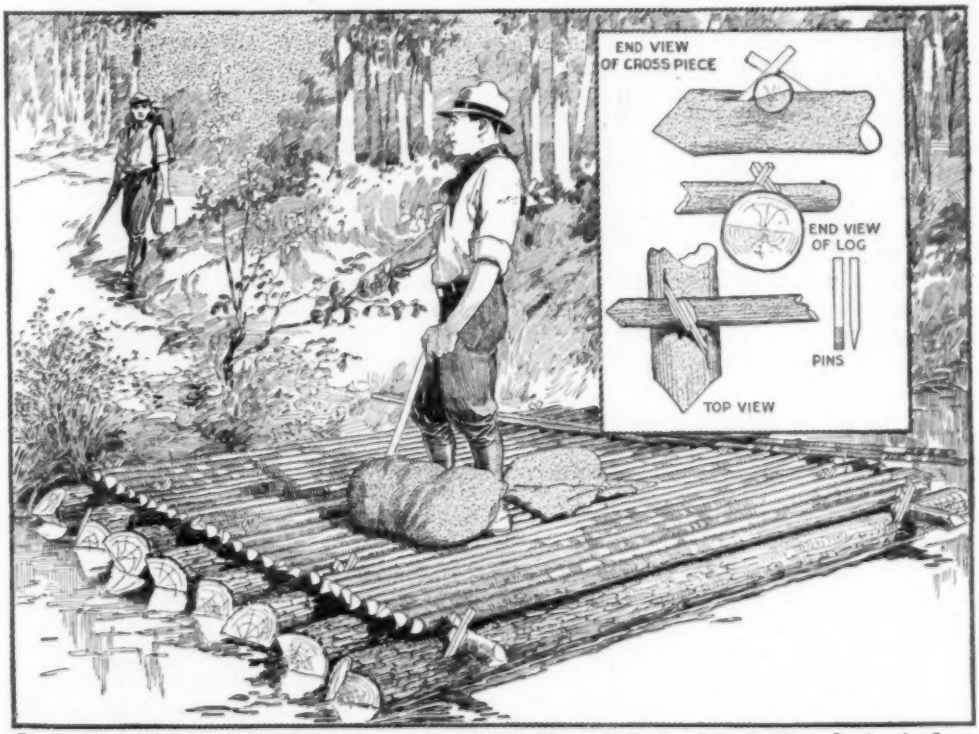




A Woodsman's Log Raft

By A. M PARKER

MAKING a raft for crossing a stream, or other small body of water, is often a diversion for campers, who have the usual supply of camp tools and materials. The woodsman is sometimes confronted with a different situation: He has only a hand ax as his tool equipment, and to construct a fairly safe raft of crude materials becomes necessary in order to pursue his course. Logs are readily available, and he may be fortunate enough to find willow withes, various stringy kinds of bark, or even coarse seaweed. If these are not available, the practical woodsman, particularly of the northern regions, builds a raft of logs, pinned together firmly with poles and pointed wooden spikes, cut on the spot. The method, as shown in the illustration, is simple and interesting. It may be of service in the woods even when other methods of binding the logs into a raft are possible, and as a practical test of woodcraft for the amateur or boy camper it is of interest. The sketch shows the completed raft, bound together by wooden pins notched into



The Inventive Woodsman Builds His Log Raft of Simple Materials Gathered at the River Bank; the Logs and Poles are Notched Together Firmly and Held with Wooden Pins

poles, and the inset details show the manner in which the poles are clamped by the crossed pins.

This method of construction may be applied to a variety of rafts, for carrying small or large loads. In selecting the material for the raft several points must be considered. Dry logs are preferable to wet or green ones, and if the latter are used, a relatively larger raft will be needed to carry a certain load. For one passenger, three logs, 9 to 12 in. in diameter, 12 to 16 ft. long, and spaced to a width of 5 ft., will provide a stable raft. Poles may be laid across it to give sufficient footing. For heavier loads the logs should be about the same length and diameter, but spaced closer together, and laid to form a raft of considerable width and of greater buoyancy.

Select a shore, sloping gently into the water, if possible, and cut the logs and poles as near this place as is convenient. Cut the logs and roll them to the bank, alternating the butts, if there is any considerable difference in the diameter of the ends. Cut a supply of poles of about 3-in. diameter, and of the length necessary to reach across the proposed raft. Then cut a number of pins of hard wood, 1 ft. long, and sharpened on one end, as shown in the detailed sketch.

Roll the first log—one of the largest—into the water until it is nearly floating. If it is bowed or crooked, place the "humped" side toward the outer edge of the raft. Chop notches, 2 in. deep, in the top of the log about 1½ ft. from the ends, and squarely across. Place a pole in the notch, with its end projecting slightly beyond the log, and cut a double notch in the upper edge of the pole, as shown in the detail sketches, so that when the pins are driven into the log, they will rest diagonally in the notches cut into the poles. Make rifts in the log with the ax, cutting as though to split off a slab of bark and wood, rather than toward the center of the log, and drive two of the pins into place. Properly done, this will make a remarkably strong joint. Fasten a second pole at the other end of the log, and prop up both poles so as to permit the next log to be rolled into the water, under the poles.

Notch the second log before slipping it finally into place. Alternate ends only, of the inner logs, need be fastened, and if time is important, some of the logs may be left unfastened, provided they are held tightly between the logs that are pinned. Shove the raft out into the water as each log is added. If there is a strong current it is desirable to guy the raft with a pole to the bank, downstream. The last log, which should also be a large one, is then floated down and pinned at both ends.

The raft may then be floated, and is ready to be covered with light poles or brush, to provide a dry footing and a place for the dunnage. The dunnage is placed near the forward end of the raft, and the person controlling it sculls with a pole at the rear.

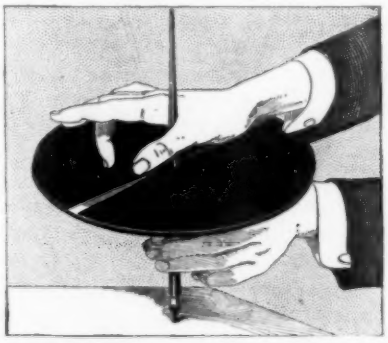
Curved Printing Surface for Sharp Focus in Bromide Enlargements

Practically all of my negatives are of post-card size, and, in making bromide enlargements, I experienced difficulty in getting a satisfactory focus on 6 by 10-in. or 8 by 12-in. prints. When the center of the picture was in focus the outer portions were usually blurred, and vice versa. Compromising between the two gave unsatisfactory results. By providing a curved surface, on which the bromide paper is mounted, results were obtained that are satisfactory except for architectural subjects. A wooden box was made as long as the desired print and 1 in. wider. The height may be made as is convenient, but a height of about 2 in. is satisfactory. A partition was fitted into the box, dividing its length into two compartments. The upper edges of the center partition and the ends of the box were cut in the shape of an arc, the curve being determined

by the distance from the lens to the easel when the center of the picture is in focus. The bromide paper is fitted to the curves on the box. The device is fitted to the easel by means of two strips fixed to the bottom of the box, and extending beyond its ends. The curved surface may be covered with cardboard to give a better backing for the bromide paper, which is held in place by pins or small tacks. Where only a small portion of the negative is to be enlarged, this difficulty will not present itself, the flat surface being satisfactory.—Victor Woodland, Denver, Colo.

Playing Talking-Machine Records with the Finger Nail

Talking-machine records may be played with the finger nail, and a person skilled in the process can afford a party of spectators much amusement, creating no little surprise. The record is placed over a penholder, or pencil, and supported by the left hand as shown in the sketch. It is revolved by the fingers of the left hand, and the nail of the second finger of the right hand is applied to the record. Practice is required to obtain satisfactory results and an old record should be used.—George S. Nissen, Chicago, Ill.



Talking-Machine Records may be Played with the Finger Nail after a Little Practice

¶Finely powdered graphite dusted on the parts of a motorcycle clutch when repacking it after cleaning will act as an excellent lubricant.

Safety Chopping Block

Chopping of pieces of wood, which must be broken into short lengths, is often dangerous. The chopping block shown in the illustration was designed to overcome this element of danger and it may be used for chopping small kindling wood as well as for breaking up heavier pieces. When the blow is struck on the wood to be broken the pieces are thrown away from the person chopping. The sketch shows the device in use for the chopping of short pieces of wood, and the heavy portion may be used as a seat. The smaller sketch shows how the block is built up of 2-in. planks, bolted together.—A. S. Thomas, Amherstburg, Canada.

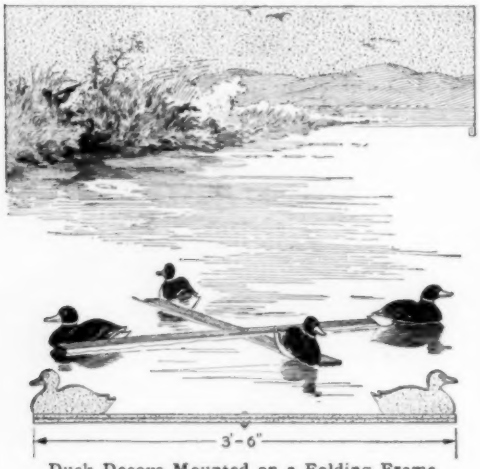
This Chopping Block Makes for Safety in That Pieces Chopped are Thrown Away from the Worker

Repairing a Broken Reed Handle

A strong repair for a broken reed handle, like those on market baskets, handbags, or workbaskets, may be made by joining the broken parts with a ferrule of tinned sheet metal, brads or wire being used to prevent the ends from working loose. After the metal fitting has been made, the handle is rewound with the ends of the material unwound from it, or if desirable, the entire handle may be re-covered with material of the original kind or other suitable substitute.—R. E. Brown, Portland, Ore.

Duck Decoys Mounted on Folding Frame

The duck hunter who wishes to economize by making some of his equipment will be interested in the

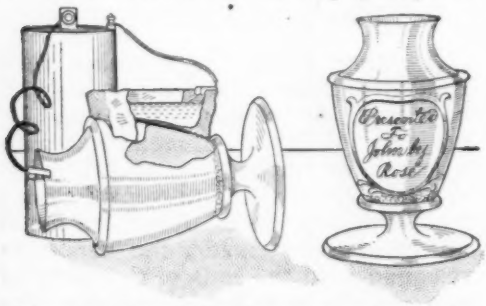


Duck Decoys Mounted on a Folding Frame may be Made by the Hunter

folding frame for duck decoys, shown in the illustration. It is made of two strips, ¾ in. by 2 in. by 3 ft. 6 in., of soft wood, and fitted with a bolt at the middle, so that it may be folded, for convenience in carrying. The decoys are cut from a sheet of tinned metal, and are painted to resemble the game. —Carl A. Haberlein, McPherson, Kan.

Onlaying Script on a Trophy Cup

A novel method of inscribing names or other indications on trophy cups or



Copper or Other Metal may be Deposited on the Surface of the Cup, Making an Effective Inscription

medallions is to onlay copper, or other contrasting metal, upon the surface by the process illustrated. Beeswax, or paraffin, is fixed to the side of the cup and formed into a dish shape, the surface on which the onlaying is to be done being covered with only a thin layer of the wax. With a needle or other suitable instrument, scratch the markings desired through the thin layer of wax to the surface of the cup. Pour copper sulphate into the wax cavity, if the onlay is to be of copper, and suspend a small piece of pure copper in the liquid, connected with the positive pole of a storage battery, or other similar electrical source. Attach a wire from the negative pole of the battery to the cup. The copper will be deposited on the surface of the cup where the thin layer of wax has been scratched off, exposing the metal. The thickness of the deposit will depend on the length of time that the current is permitted to flow. Ten hours of action will permit the depositing of a satisfactory onlay.—M. H. Edwards.

Economy in Motorcycle Tires

Caution in the use of motorcycle tires with a minimum of abuse will result in a considerable tire saving. Tremendous wear on a single spot results when the power is thrown in so suddenly that the driving wheel makes several revolutions before gripping the ground. The proper air pressure must be maintained in the tires in order to obtain good wear. Guessing is a poor method of determining the air pressure, and the exact condition should be noted from time to time with a gauge. Ordinarily, a pressure of 45 to 50 lb. should be maintained in the rear tire and about 20 per cent less in the front tire, in the case of 3-in. tires. Rim-cutting from running motorcycle tires underinflated is the commonest abuse. Dents in the edge of the rims cause undue wear on the tire, the fabric being worn through by the constant rubbing. Bent rims are often caused by insufficient air pressure in tires, the liability to injury being increased when crossing tracks or bumps with an improperly inflated tire.

The Sporting Rifle and How to Use It

by Stillman Taylor

SPORTSMEN are interested in rifles and rifle shooting largely from the hunting standpoint, although target shooting is a favorite sport with many of them. This discussion of the sporting rifle will be concerned, therefore, principally with the hunting aspects, other forms of shooting being considered as good methods of practice, and the development of skill in the use of hunting weapons. The novice, as well as the good shot, must have a suitable weapon, and should have at least a general knowledge of the types of rifles available, and their common uses. A number of representative types of rifles are shown in Fig. 1, and the details of the breech mechanisms and sights in Fig. 2. Targets and a homemade device for backing them are shown in Fig. 3. The full-page illustration shows several positions in the use of the rifle; a moving-target arrangement, to be constructed by the ambitious shot; a diagram of the trajectory of a rifle bullet, and several diagrams of the vital shots, in hunting common big game.

The single-shot rifle, shown at A, Fig. 1, has been largely supplanted by the repeater and the automatic, so far as hunting is concerned. For use exclusively in indoor shooting, a heavy rifle of the "Schuetzen" type is best suited. A high-grade ornamented rifle of this type is shown in the headpiece of this article.

The most popular type of American rifle is the repeater of the lever-action variety, shown at B. The lever action embodies many good points: quickness of fire, ease of operation, freedom from jamming at a critical moment, strength, and plenty of stopping power. The mechanism of the lever-action repeating rifle is shown in detail at J, Fig. 2, and that of the falling-breech-block type of single-shot rifle, at K. Several other types of lever-action rifles are shown in Fig. 1.

Almost all lever-action repeaters are of the tubular-magazine type, the magazine extending under the barrel, sometimes the full length—full magazine; or halfway — half magazine. Rifles of these types are shown at B and C, and a hammerless repeater at D.

The trombone, or pump-action, repeating rifle, shown at E, has a mechanism similar to that used in the repeating shotgun, the sliding forearm loading and ejecting the cartridge. The merit of the military bolt-action rifle lies in its great strength and simplicity. A weapon of this type was used by Roosevelt in Africa, and by other big-game hunters. It is shown at F.

The chief advantages of the automatic rifle, shown at G, which is a comparatively new weapon, are its speed in firing and its almost noiseless action. This rifle has a recoil-operated action of the blow-back type. That shown at H has a box magazine, and the automatic action is based on the sliding of the barrel within a steel jacket. The rifle shown at I may be used either as an automatic or as a pump-action weapon.

The subject of stock and trigger adjustment is one to which every experienced rifleman devotes considerable attention. The regular stock rifle is built to standard dimensions, and often the stock is found a trifle short. For the man of average reach, a 13¾-in. stock, with a 1⅞-in. drop at the comb, and

about 3 in. drop at the heel, will be found satisfactory.

Rifle sights are of several types, of which there are in turn many varia-

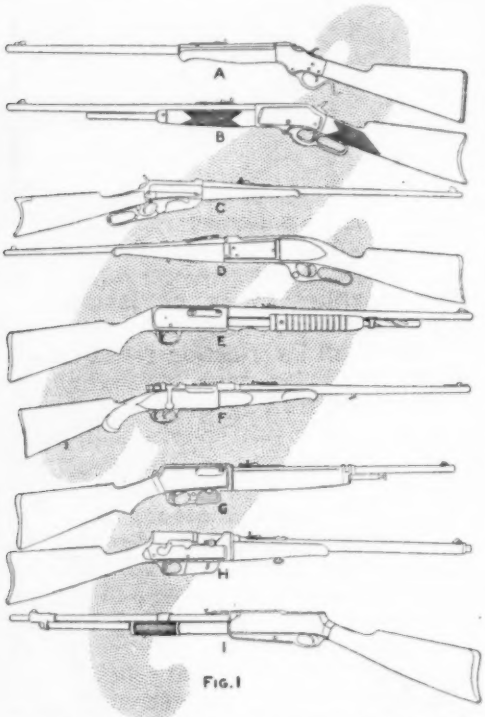


FIG. 1

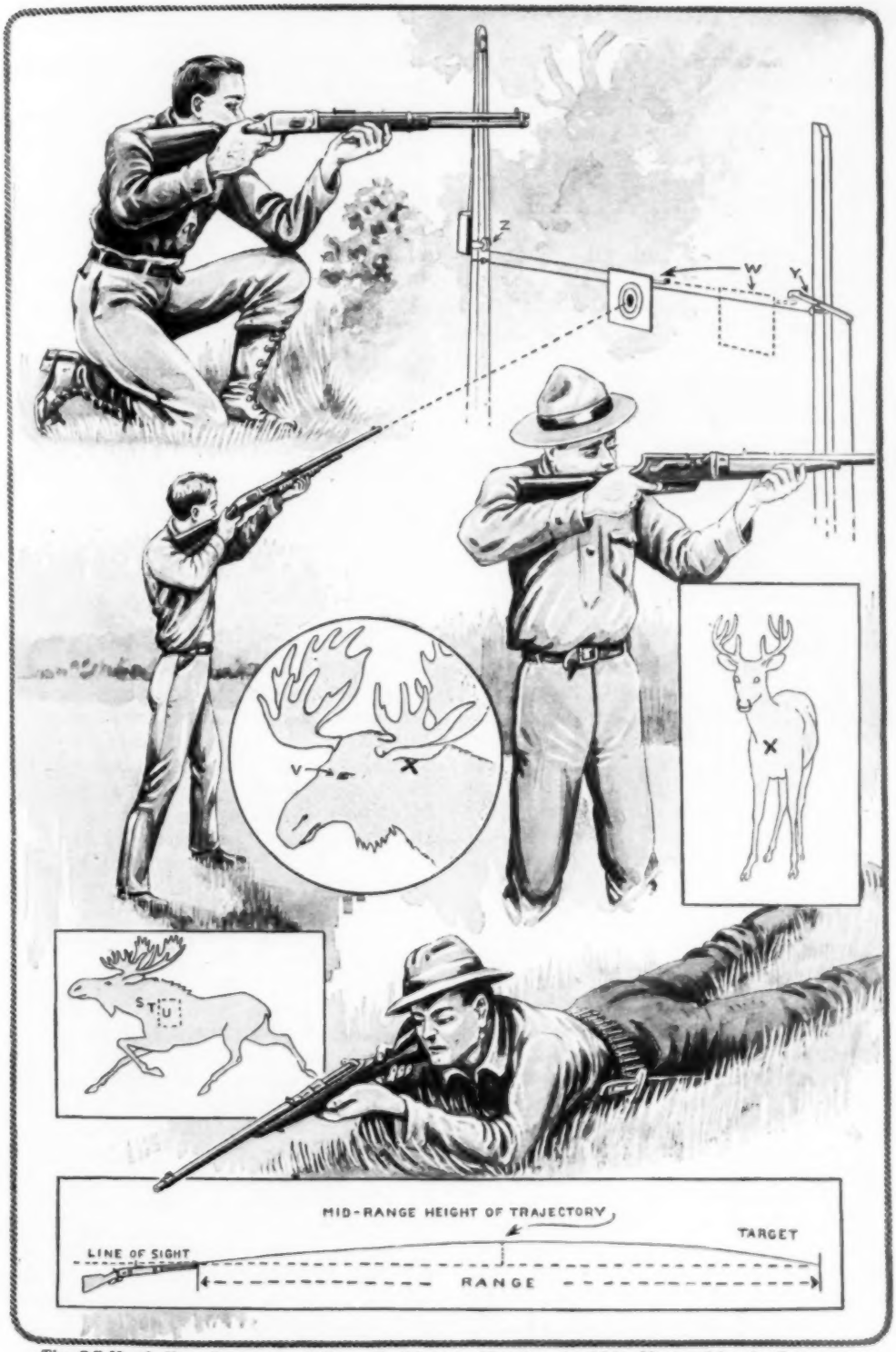
Various Types of Rifles in Common Use: A, English Model, Single-Shot, with Open Sights and Shotgun Butt; B, Lever-Action Repeater, Tubular Half Magazine; C, Lever-Action Repeater, Box Magazine; D, Hammerless, Lever-Action Repeater; E, Pump-Action, High-Power Repeater; F, Military Bolt-Action, Sporting Model; G, Automatic, Blow-Back Action; H, Automatic, Box Magazine; I, Automatic, Combination Pump-Action

tions. Only the essentials of the standard types will be considered. The regulation open sights, with which most rifles are fitted at the factory, are the buckhorn rear and the Rocky Mountain front sight. For a hunting rifle the most satisfactory sights are a gold-bead front sight of about $\frac{3}{32}$-in. diameter, as shown in Fig. 2 at L; a folding-leaf rear sight, shown at O, P, and Q, and a combination rear aperture sight, at M and N, mounted on the tang of the rifle. An arm so sighted is useful for all kinds of shooting. The combination rear sight is used in deliberate shots at a target or at game, and the folding-leaf sight is better than the buckhorn for quick snap shooting.

The sportsman who wishes to master the use of a rifle must have a knowledge of the trajectory of such weapons, and particularly of the rifle he uses regularly. He must know, also, how to aline the sights correctly to get satisfactory results. The trajectory is the path which the rifle bullet takes in passing from the muzzle of the rifle to its mark. The force of gravity acts upon the bullet in flight and the result is that the trajectory is curved, as indicated in the diagram at the bottom of the page illustration. A relatively low trajectory is, of course, desirable in a hunting rifle. The black-powder, or slow-speed, cartridge has a relatively high trajectory, while the high-power smokeless cartridges have relatively low trajectories.

The adjustment of the sights of a rifle is also of much importance. Every rifle is targeted at the factory, but this may be done by a fair shot, using the following method: Arrange three boxes, so that the rifle barrel may rest upon one, and the arms of the marksman upon the other two. Place a bag of sand upon the box, so that the barrel may rest upon it, about 6 in. from the muzzle. Put the target into place, and adjust the sights for 100 yd. If the sights are properly lined up, the shots should fall quite regularly within a 10-in. circle. With peep, or other target, sights, much finer results will be obtained. In moving the sights it must be remembered that to move the rear sight to the right will bring the shot to the right, and vice versa, while if the front sight is moved to the right, the arm will shoot to the left. In making the test, first adjust the front sight so that it is in exact alinement with the center of the barrel, and then all corrections may be made by moving the rear sight.

The proper way to sight a rifle is to hold the front sight just clear of the notch in the rear sight, with the front bead barely touching the outer ring of the bull's-eye, at the extreme bottom. This is shown at R, Fig. 3. It is the



The Off-Hand, Knee-Support, and Prone Positions in Shooting should be Mastered by the Sportsman. The Diagrams Represent Several Vital Shots, the Moving Target, and the Trajectory of a Rifle Bullet

rule of good rifle shot to "see daylight between the sight and the bull's-eye." In any event, do not cover up the front sight by drawing it down into the notch of the rear sight, so that only the top of the bead is visible. Another frequent error is to hold the front sight to cover the bull's-eye.

The sportsman who wishes to become a practical rifle shot should learn how to handle the rifle in the several useful positions, so that he may be able to sight accurately under different conditions. Several of the most widely used positions are shown in the page illustration. The off-hand position, with arm extended, is the most commonly used and best position for the sportsman to practice, for use in the woods. The off-hand, with body rest, or elbow resting on the hip, is good for target shooting. The "Schuetzen" style of holding the rifle, with palm rest, is used only in fine match shooting.

The knee-rest position is often useful for the sportsman in stalking game, when it is desirable to expose oneself as little as possible. A steadier aim may be secured, especially if a strong wind is blowing. The prone position is much used by military riflemen, but they are not permitted the muzzle rest, whereas the hunter often uses it. It is easy to learn, and more accurate shooting may be done in this position than in the off-hand or knee-rest positions.

For indoor practice at a target, the .22-caliber rifle is best. By fitting up a suitable backstop, shooting may be done safely in the cellar or attic. A satisfactory backstop may be made by fastening a plate of iron into a packing box, 3 ft. square, as shown in Fig. 3. The plate must be set at an angle so that the bullets will be deflected to the bottom of the box.

In order that the rifleman may check up his work, it is desirable that a standard target be used. The American standard target, shown in Fig. 3, has been adopted by practically all rifle clubs, and, as the majority of records are made upon it, the sportsman should become familiar with it. The paper targets are inexpensive, and it is easy to draw accurate homemade targets from the original. By the use of disks of black and white paper—known as gummed target pasters—one target may be used several times.

If convenient to do so, the novice should shoot a string of shots every day, in the various positions. Do not try to hurry, but shoot deliberately at first, aiming to secure a good average, rather than a few bull's-eye shots and many wild ones. With reasonable practice, it is not difficult to score eight bull's-eyes out of ten shots, when using the prone position. Having attained this proficiency, the sportsman may be regarded as a fair shot, and is ready to take up outdoor target practice with the high-power rifle.

For outdoor target shooting the .22-caliber, long-rifle cartridge will give very accurate results up to 100 yd. The standard target has a bull's-eye measuring 6 in. in diameter for 150 yd. Shooting may be tried for a while at a fixed range, then the target may be moved to an unknown distance and angle, and the marksman can try his hand at estimating distance. Instead of changing his sights at varying distances, the sportsman should learn how to estimate the distance of the mark and the approximate elevation of the sights to land the bullet within the circle. This is valuable practice for good shooting in the woods.

After considerable practice at the stationary target, quick firing may be varied by rigging up a sliding trolley arrangement, like that shown in the page illustration. It is easily made by setting up two poles, properly braced, one about 30 ft. tall, and the other about 10 ft., spaced 30 ft. apart. Between the poles, about 8 ft. from the ground, stretch a length of stiff telephone wire, and make a wooden target block W, with a metal sheave wheel, so that it may slide freely along the wire. On the tallest post, a little above the wire, fasten a metal pulley, Z, and at the top of the pole place a sash pulley. Then attach a stout cord to

the target block, reeve it through the two pulleys, and attach a sandbag, or other weight, to the end of the cord. On the shorter post, a latch, or trigger, Y, is fastened to hold the target, which is released by pulling a string. With this easily constructed device, much valuable practice may be had, for if the pole is fairly high, the weight will cause the target to slide as rapidly as the average game bird travels. In using this moving target, just as good practice is obtained with a .22-caliber repeater as with a high-power gun. In fact, the high-velocity ammunition should be used only on a regular range, or where a suitable backstop is erected to stop the high-power bullets. Such a backstop may be constructed of heavy timber, like old railroad ties, in the form of a crib, which is filled in with sand or earth. When a natural background, such as a mound or hill, is at hand, this may be used with safety, but a rocky hillside is not satisfactory, for it is likely to deflect the bullets, and may cause injury through stray shots.

As our antlered game, like the moose, the Virginia deer, the caribou, and the elk, are held in higher esteem than other American big-game animals, a few practical hints on where to sight, may serve to bring better luck to the sportsman who has yet to bring in his first head. The shoulder shot, shown in the rectangular sketch at S, T and U, is taken by the experienced hunter whenever possible, in preference to any other. It is the object of this shot to break the shoulder joint, and thus prevent use of the forelegs. It is a vital shot, also, because there is a good chance of the bullet passing through either the heart or lungs, which will drop the game in its tracks. This is the most effective of all shots, and as the hunter more often draws a bead while the game is running away, the shoulder shot is used more than any other. The exact spot, at which the aim should be taken, depends upon the distance of the animal, and its rate of movement. If on the run and the range is 100 yd. or more, the sight should be taken at the point S. If less than this distance, sight at T, and, if the animal is standing still, take deliberate

FIG. 2

J, Mechanism of Lever-Action Repeating Rifle: 2, Breechblock; 7, Cocking Lever; 19, Firing Pin, Front; 21, Firing Pin, Rear; 29, Guard Finger Lever; 34, Hammer; 36, Lifter; 37, Locking Slide; 45, Mainspring Plunger; 46, Mainspring Plunger Seat; 63, Trigger

K, Mechanism of Falling-Breechblock, Single-Shot Rifle; L, Gold-Bead Front Sight; M and N, Combination Rear Aperture or Tang Sight, Raised and Folded; O, P, Q, Folding-Leaf Rear Sight, Used as V-Crotched Sight, Straight-Bar Sight, and Folded Flat to Barrel

aim at U, within the dotted inclosure. This area represents what big-game hunters call the vital zone, and a soft-nose bullet, placed anywhere within this spot, will be certain to stop the game, often dropping it on the spot. It is possible to land a bullet in a vital spot at distances up to 500 yd. with a high-power rifle, but it is very likely that the game will be wounded only, and may escape to die a lingering death. In taking long shots at big game on the run, the sight should be taken well forward and a trifle higher than the marks given, since the hunter

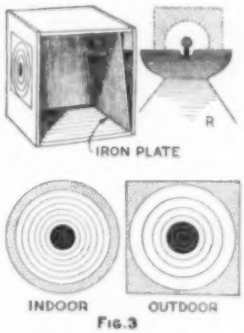


FIG. 3

must allow for the trajectory of his arm and the time the bullet takes to reach its mark.

The front shot, shown at the right, has as its object to hit the heart or lungs. It is a useful shot, and the sight is taken at the cross indication on the breast. The head shot, shown in the circle, is a brain shot, and is used only by the experienced hunter, when it is difficult to land a shoulder or front shot. As the brain is well up to the top of the head, the best point of aim is shown at V, midway between the eyes and a trifle higher than their centers. This shot is most effective when the hunter stands a trifle above the game, or shoots when the game is charging head down. If on a level, aim just above the eye, and if close to the game, land the bullet just below the eye. The ear shot, as indicated by the cross, is taken at close quarters, and the point to sight for is the inside of the ear at its base.

A good rifle will give a lifetime of service, and the sportsman should take care of it. The best time to clean a firearm of any kind is as soon after shooting as possible, for the powder residue is then fresh and moist, and is more easily and quickly removed. Black powder can be removed with a wet rag, but smokeless powder not only leaves a little powder residue, but also a film of gummy residue on the steel which is not apparent to the eye. Common washing soda, dissolved in water to make a saturated solution, is used to remove it. Any of the ready-prepared nitro solvents are good for cleaning the rifle. A good way to clean a rifle is to use strips of cotton flannel, cut into squares of such size that they will fit snugly, but may be easily pushed through the barrel on the head of the metal cleaning rod. Always clean a rifle from the breech, if possible, by resting the muzzle on a few folded papers on the floor. Push a couple of dry wipers down to the floor to remove the carbon residue. Then saturate another square of cloth with the nitro solvent, and carefully swab out the barrel, turning the rod so that it will follow the spiral rifling. Repeat the operation two or three times; then take a clean wiper, moistened with the solvent, and repeat until the barrel is well lubricated with the cleaning fluid. The barrel should be well oiled with any good, thick oil, or liquid vaseline. The lock mechanism of the arm should be kept clean and very lightly lubricated with any good thin oil, and the gunstock polished with linseed oil.

Camera for Taking Pictures from a Kite

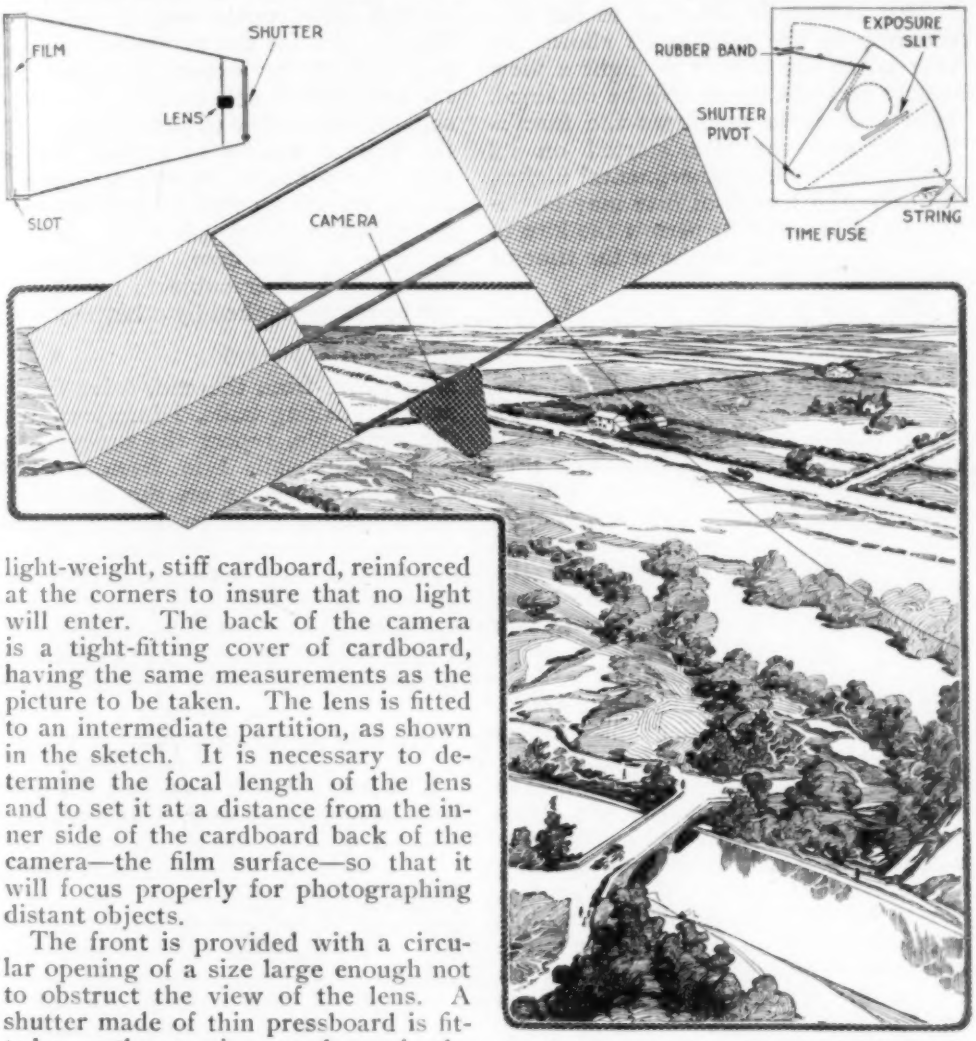
By CHARLES I. REID

WHEN watching a kite flying at a considerable height one frequently wonders how the landscape appears from such a viewpoint as would be possible from a kite. Few of us can have the experience of a ride in an aeroplane, but it is quite possible to obtain a view from the kite, by proxy as it were, through the use of a kite camera. A kite of large dimensions would be necessary to carry an ordinary camera taking pictures of fair size, hence it is necessary to devise one of lighter construction, so that a kite of moderate size may carry it to a height of several hundred feet. Such a camera is shown in the illustration attached to a box kite. Details of construction are shown in the smaller sketches.

A camera consists, briefly, of a light-proof box, with a lens at one end and a sensitive plate or film at the other. For a kite camera, a single achromatic lens will suit the purpose. Such a lens is not expensive and may be taken from a small camera. It must be obtained before the camera is begun, since the size of the latter is dependent upon the focal length of the lens and the size of the picture to be made. A camera taking pictures 2 in. square is satisfactory for kite photography, and if it is desired to enlarge the pictures, this may be done in the usual manner.

The box of the camera is made cone-shaped in order to reduce the weight and air resistance. Its sides are of light-weight, stiff cardboard, reinforced at the corners to insure that no light will enter. The back of the camera is a tight-fitting cover of cardboard, having the same measurements as the picture to be taken. The lens is fitted to an intermediate partition, as shown in the sketch. It is necessary to determine the focal length of the lens and to set it at a distance from the inner side of the cardboard back of the camera—the film surface—so that it will focus properly for photographing distant objects.

The front is provided with a circular opening of a size large enough not to obstruct the view of the lens. A shutter made of thin pressboard is fitted over the opening, as shown in the sketch at the right. A slit is cut in the shutter through which light is admitted in making the exposure as the shutter is drawn back. The size and width of the slit regulates the exposure, and a few trials must be made to determine the most suitable speed of exposure for the lens used. The shutter is pivoted at its lower end and drawn back by a rubber band. A string, to which a time fuse is attached, controls the releasing of the shutter to make the exposure.



The Kite Camera Offers a Diversion in Photography, and Has Practical and Commercial Uses as Well. The Camera Shown Is of Light Weight, Simple Construction, and Produces Film Exposures Two Inches Square. A Sectional View of Its Construction is Given at the Left, and the Details of the Shutter Device at the Right

The string holds the shutter closed against the pull of the rubber band until the fuse burns up to the string, severing it. The fuse must be long enough to enable the kite to attain a suitable height before the string is burned. When the shutter has been set, and the fuse attached ready for lighting, the camera may be taken into the dark room for loading. A piece of film, cut to the proper size, is placed carefully

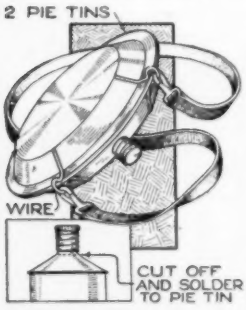
into the light-proof sliding cover, as with a film pack, the sensitive side, of course, being placed nearest the lens.

The camera is attached to the kite securely at the middle, as shown, so that when the kite is in flight a view nearly straight down will be obtained. When all is in readiness the fuse is lighted and the kite started on its flight. By timing experimental flights, the required length of fuse may be determined in order to permit the kite to attain the desired height at the time of exposure.

The kite used for taking pictures from the air should be large enough to carry the kite easily. One of the box type illustrated is satisfactory, although other types may be used. A kite camera for the amateur has great possibilities for experimentation, but requires care in construction and a reasonable knowledge of photography. To the person willing to master the details, kite photography offers a pleasurable diversion as well as practical uses in photographing plots of ground, groups of buildings, manufacturing plants, and other subjects which cannot be photographed by other methods.

How to Make a Canteen

Two sheet-metal plates that are well nickelplated may be joined and provided with a suitable opening, to form a useful canteen for the camper or hiker. The illustration shows such a convenience fitted with a shoulder strap ready for use.



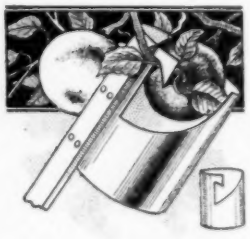
It was made as follows: Two good-quality pie plates were soldered at their edges to form a water-tight container. An opening was cut into the edge and a screw cap, taken from a metal-polish can, was fitted carefully and soldered over the opening. A wire was soldered at each side of the screw cap, providing loops for the snap buckles of the shoulder straps.—J. R. Townsend, Itasca, Texas.

Mixing Stick That Breaks Up Lumps

In mixing paint, or paste, it is desirable that all lumps be broken up quickly, and that the forming of lumps be prevented as much as possible. A mixing stick that will aid in this process is made as follows: Procure a stick of wood, that will take nails without cracking, and cut it about 1 in. square and 12 in. long. On one side, beginning ½ in. from the end, drive five 8-penny finishing nails, 1 in. apart. On the next side, repeat the process, beginning the nails 1 in. from the end. Place similar nails on the other two sides, spacing them to offset those on the other sides. The nails cause a thorough mixing of the paste, or paint; prevent the forming of lumps of any considerable size, and by careful stirring will break up all lumps in the mixture.—Edwin R. Mason, Danville, Ill.

Tin Can on Rod for Picking Fruit

The best apple is usually a little beyond reach, as every boy knows, so I fitted a tin can, cut as shown in the sketch, to a pole and can easily pick the apple that I want. The device is useful for picking many varieties of fruit, and prevents damaging it by a fall. For picking apples or other fruit from the upper branches of trees, where it is almost impossible to reach by the use of a ladder, the tin-can fruit picker is especially handy. The small sketch shows how the edge of the can should be cut to afford the best grip on the stem, making it possible to cut the twig from above or below.—T. A. Charles, Hamilton, Ont.

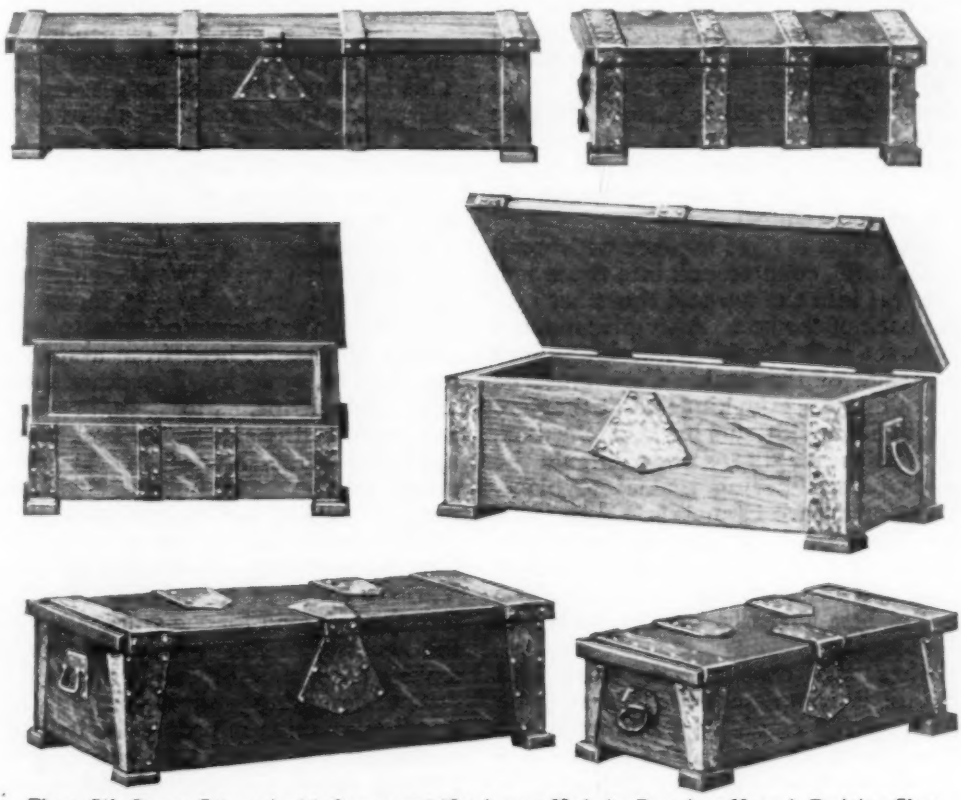


Miniature Metal-Bound Chests

By F. E. TUCK

BOYS in a manual-training class became very enthusiastic over the making of small chestlike boxes, bound with ornamental metal, and adapted them to a great variety of uses. The boxes were designed to suit the taste of the maker and for use as glove, handkerchief, jewelry, toilet, treasure and other boxes, lined with silk, and finished in wax and varnish, in various stains. Oak was used for most of them, and the metals employed were largely copper and brass, although silver is suitable for small boxes. They are simple in construction, as shown in the working drawings, and can be made in the home workshop. The photograph reproduced shows a group of boxes, for various purposes, and in several styles of metal binding. The long box at the top is for gloves or ties; the larger ones are for the boys' personal use, caring for collars, handkerchiefs, etc.; the smaller boxes are for the dresser, providing for the care of jewelry and similar small articles. The boxes proved great favorites as gifts, and the monogram of the recipient may be etched into the metal.

Well-seasoned oak is the most suitable material for the making of the boxes, as it harmonizes well with the plain metal trimmings. The quarter-sawed variety is preferable, being more ornamental, and less likely to warp or twist. For most of the boxes, stock $\frac{3}{8}$ in. thick is suitable, although this may be cut down to $\frac{5}{16}$ in. for the smaller boxes, if convenient. The method of joining the pieces is similar in all the varieties of boxes, and the jewel box illustrated in the working drawings will be taken as a specimen. The sides of the box are butted against



These Gift Boxes, Trimmed with Ornamental Metal, were Made by Boys in a Manual-Training Class. A Long Glove Box is Shown Above; the Larger Boxes Are for Handkerchiefs, and the Smaller Ones for Jewelry and Trinkets

the ends, lapping over them, flush, and nailed with small brads. The bottom is fitted between the sides and ends, and nailed so that the nails are concealed by the metal bands, at the four corners, and at other points, if bands are placed near the middle. The stock for the box is cut and finished on all sides to the following dimensions: all pieces to be ⅜ in. thick; top, 4½ by 7½ in.; two sides, 1⅞ by 7 in.; two ends, 1⅞ by 4 in.; bottom, 3¼ by 6¼ inches.

All the pieces should be scraped carefully to a smooth finish, and the nails started with an awl, or a slightly flattened nail of the same size, fitted into a hand drill. Extreme care must be taken, in nailing, that the surface of the wood is not marred, which is likely to occur if the nails are driven into the wood too rapidly, or without starting holes for them. The feet are cut from a strip, ⅜ in. thick and ¾ in. wide, the cut edges being sandpapered smooth without destroying the squareness and the sharp corners. They are nailed to the bottom of the box with brads, care being taken to have the end grain of each block at the end of the box, particularly if the metal trimmings do not cover the blocks.

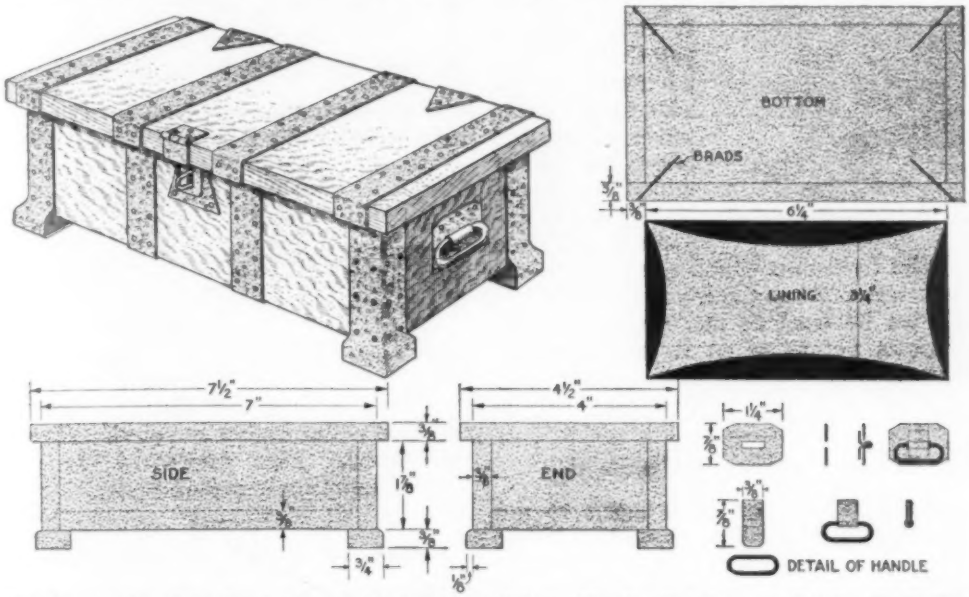
The cover is fixed in place with small plain butts, countersunk into the wood, one leaf into the top and the other into the back of the box. A simpler method is to set both leaves of the hinge into the edge of the back. Care must be taken in fitting the hinges that they are set in line with the back of the box, and holes for the screws should be made before driving them into place. Too much care cannot be taken with the fitting of the hinges, as the proper fitting of the lid, both as to resting level and being in line with the edges of the box, depends on the fitting of the hinges.

After the construction work and nailing is completed, the box may be sandpapered carefully, rubbing in the direction of the grain, and being careful not to round off the edges unduly. The oversandpapering of woodwork marks the work of the careless novice. The box should be handled as little as possible while the metal trimmings are being fitted, and, before the finish is applied, should be gone over lightly with sandpaper to remove dirt. When the metal pieces are fitted, and ready to be fastened in place, the finish may be applied to the box. Warm browns, or other dark-oak finishes, are best suited to the simple style of chest, and the metal fittings. A coat of stain should be applied, and this followed, when dry, by a coat of filler, rubbed well into the pores of the wood. The filler should be permitted to dry hard, and the surface is then sandpapered very lightly with a fine grade of paper —No. 00 is best. Do not rub through the filler or stain, particularly at the corners. Wax is the most readily applied outer finish. Several coats may be used to give a substantial finish. A coat of shellac, followed by coats of rubbing varnish, dried well and rubbed between coats with No. 00 sandpaper, may be applied for a high-gloss finish. This is a more involved process and requires that the varnish be rubbed down with pumice stone and water, and finished with an oil polish.

Copper or brass, of No. 20 gauge or lighter, is suitable for the making of the trimmings. The details of the handles are shown in the sketch, at the right. Cut a back plate, ⅞ in. by 1¼ in., and fit the handle of wire to it by means of a strap, bent from a strip of metal, ⅜ in. by ⅞ in. The other bands are merely strips, ½ to ¾ in. in width, and fitted to the size of the box, where applied. Strap hinges of the same metal may be made, but the most convenient method for the amateur is to fit the metal strips into place at the hinges, merely as ornamental features. Various types of locks may be fitted into the box, and for the worker having the necessary skill, it is interesting to make a hasp, as indicated in the sketch.

The designing and making of the metal trimmings affords unlimited opportunity for originality, and a good plan is to fit the desired strips, cut from paper, to the box before making them of the metal. It is well to re-

member, in this connection, that the simple bands and forms are better suited to the plain box than ornate trimmings. Having determined upon finish may also be obtained. The metal should be polished with wax to preserve the finish if other than the latter type is used.



The Construction of the Jewelry Box Is Typical of the Others. The Handle is Shown in Detail. The Nailing of the Bottom and the Fitting of the Lining are Shown at the Right

suitable patterns for the metal strips, cut them from the sheet with snips, or tinner's shears, care being taken to produce a smooth edge. A file may be used to remove roughnesses and to round the edges of the metal slightly. The metal is fastened with escutcheon pins, which add to the ornamental effect if properly spaced. Holes for them must be drilled, or punched, through the metal.

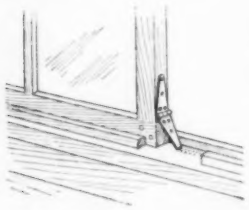
The metal may be left smooth and polished, or hammered with the round end of a ball-peen hammer, to produce the dented effect shown on several of the boxes in the group. This, as well as other finishing of the metal, must be done before it is fixed in place. Beautiful colors may be given to the metal by heating it, and observing the colors as they "run." A trial will enable one to judge the proper heat for the various colors, which "run" from a light straw to a deep purple, with various reddish intermediate tones. A brown oxidized finish, or a verd-antique—greenish—

The boxes are lined with silk or other suitable material. The method is as follows: Cut cardboard pieces to fit against the inner sides of the bottom, sides, and ends. Pad one side of them with cotton batting, and cover with silk, gluing the edges of it on the back of the cardboard, as shown in the sketch. By bending the pieces slightly, they may be inserted and glued in place. Care must be taken in handling the glue, that the silk is not soiled. Pads of felt, or chamois skin, may be glued to the bottom of the feet of the box, so as not to mar the surface upon which it rests.

The most popular boxes, which are especially suitable for gift purposes, are the jewelry, glove, and handkerchief boxes. Their dimensions are: jewelry box, 2¾ by 4 by 7½ in.; glove box, 3¼ by 5 by 13 in.; handkerchief box, 4 by 6 by 10 in. Other sizes suited to special purposes may, of course, be designed readily, and made in walnut, mahogany, or other cabinet woods.

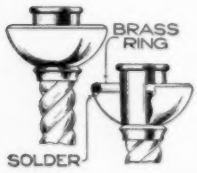
Hinge Lock for Horizontal Sliding Windows

A simple catch for fixing windows of the horizontal sliding type so that it is difficult to pry them open is shown in the sketch. It is made of an old hinge, one end of which is sharpened so as to engage the surface of the frame on which the sash slides. When not in use the hinge is folded up. It can be used to set the window at various points when it is desired to have it partly open.—T. H. Linthicum, Annapolis, Md.



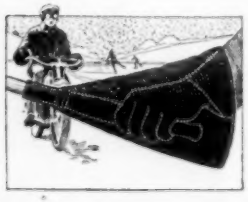
Repairing a Brass Candlestick

A brass candlestick brought to me for repairs had lost a crownlike bit of ornamentation once fitting on the top of the grease cup. To make a finish at this point I soldered therein a heavy brass nose ring. The soldering being concealed on the under portion, the effect was very good, and strength was added to the thin brass cup, preventing possible denting of the edge.—James M. Kane, Doylestown, Pa.



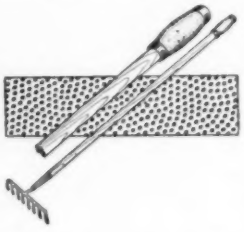
Hand Guards for Motorcyclists

When riding my motorcycle in cool weather, my hands became very cold, and in order to overcome this, I had guards, like that shown in the sketch, made of oilcloth. A piece, tapered from 10 in. at one end to 4½ in. at the other, and 12 in. long, was formed into a cone, the smaller end being fitted, with an elastic band, over the handlebar. The guards keep the hands comfortable without gloves in cool weather, and, with gloves, are of great service in the winter.—George Westaway, Davenport, Ia.



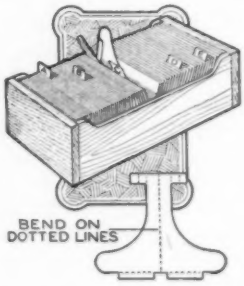
Bicycle-Handle Grip on Rake Handle

By fitting a bicycle handle to the end of a rake handle a grip is provided that is comfortable in the hand when considerable raking is to be done. The sketch shows the grip attached. Several small brads were nailed through the handle and countersunk so as not to injure the hand. This prevented the grip from becoming loosened easily.



Removal Marker for Card Index

A marker which is adapted for use in files of various sizes is shown in the illustration. It may be made easily of medium-weight cardboard, cut to the shape shown in the diagram below and bent as indicated. The marker is inserted at a point in the index from which a card or other filed material has been removed. It is of such a size that, when in use, the tab projects only enough to be recognized, and the marker may be left in the drawer so as to be convenient for future use. The sketch shows the marker partly withdrawn. The small projections shown in the diagram are important in that they act as springs when the marker is in use.—John B. Wade, Wellington, Kan.



Gaskets cut from old inner tubes are satisfactory for water connections.

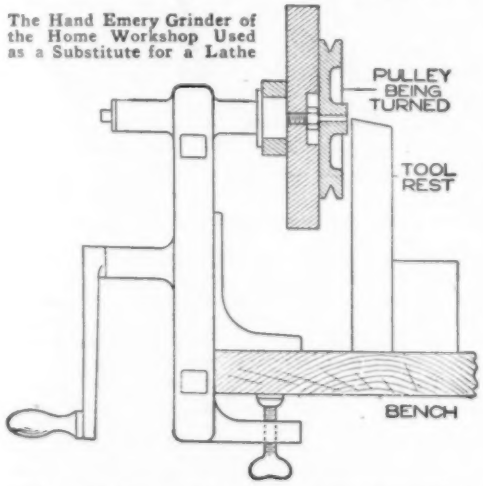
To Uncork a Bottle with a String

A convenient method of uncorking a bottle, from which liquid is to be poured frequently, is to thread a strong string or cord through the cork, tying it in a loop, which remains at the opening of the bottle. The cork may be removed easily by drawing on the string. This is more satisfactory than the use of a corkscrew, as the latter frequently tears the cork.—Lee A. Collins, Louisville, Ky.

Wood Turning on an Emery Grinder

The experimenter often requires small turned-wood pulleys, circular bases for switches, etc. To produce these it is not necessary to have recourse to a wood lathe, if a good emery grinder is at hand. Simply clamp the grinder firmly to the workbench, remove the grinding wheel, and fasten on a block to serve as a faceplate. This may be held in place by the nut that holds the wheel and should be trued up with a small chisel when in place. A tool rest may be improvised by temporarily nailing one or more blocks of wood to the bench. The article desired should be first roughed out with a saw

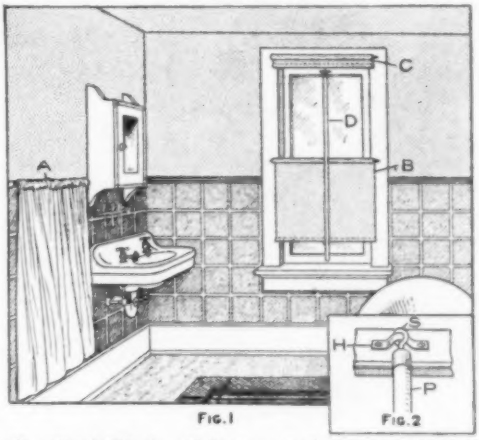
The Hand Emery Grinder of the Home Workshop Used as a Substitute for a Lathe



and then fastened to the faceplate with screws or brads, after which the actual wood turning will require very little time.

Three Bathroom Kinks

The devices for the bathroom illustrated may be made easily and contribute to the comfort, convenience,



The Fixed Window Pole Is an Inducement to Ventilation; the Curtain Protects the Wall, and the Lower Shade Gives Light with Privacy

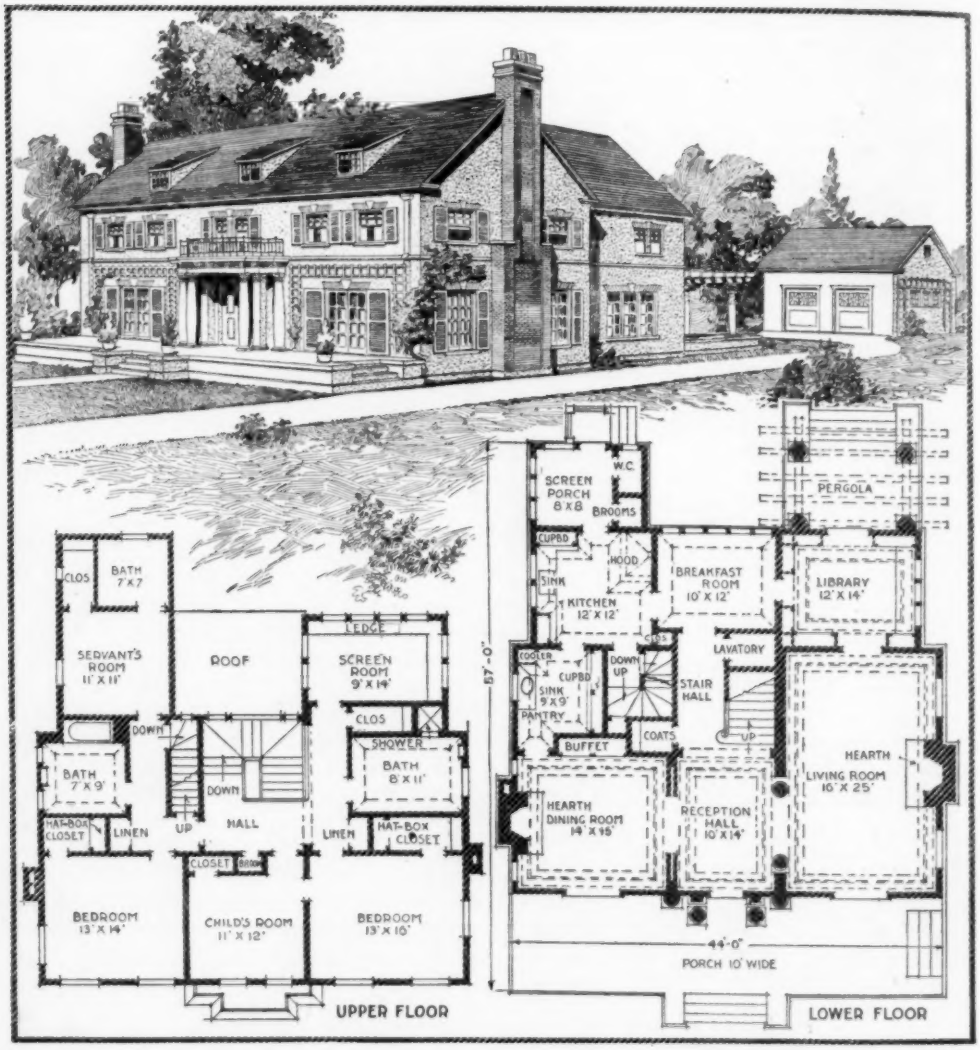
and, in the case of the fixed window pole, to the safety of the room. A wall curtain, A, placed on the towel rod, or hung on the wall beside the washbasin, is especially convenient in keeping the walls unsoiled by children who make use of the room and are likely to splash suds while washing. Double roller shades on the window, as at B and C, give light and privacy as well.

Poor ventilation in bathrooms occasionally causes asphyxiation and is often a menace. The permanent fixing of the window pole D makes it convenient to open the window, which operation is often neglected through fear of drafts from the lower sash and the lack of a pole. Fig. 2 shows the top of the pole P, provided with a screw eye, S, which is fastened to a metal strip, H.—D. L. Hough, Toledo, Ohio.

Prevents Soiling Goods after Oiling Sewing Machine

To prevent a sewing machine that has been oiled from soiling the material, the following is a good method: Tie a small piece of ribbon or cotton string around the needle bar near the point at which it grips the needle.

ROOMY STUCCO RESIDENCE OF MODERATE COST



E. B. RUST, ARCHITECT

FOR the family with few servants and no need for many guest chambers, the artistic cement-plaster house illustrated herewith offers a comfortable home of reasonable cost. Its architect estimates that it could be constructed in California, and doubtless in other places of similar climatic conditions where material and labor prices are no greater, for approximately $7,000. This figure includes the heating plant and other installations, as well as a garage at the rear. It is a frame structure with the exterior finish applied over metal lath, and buff-colored tapestry bricks used in the trimmings. The front porch is virtually a concrete terrace extending the full width of the building and giving access to a pleasing colonial doorway. Screened porches and sleeping rooms, large open fireplaces, liberal halls, spacious closets, private baths, connecting bedchambers, and abundant windows are some of the features incorporated. The floor plan explains the general arrangement and sizes of the various rooms.

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